THE REVIEW

OF

APPLIED MYCOLOGY

Vol. XV

ISSUED BY THE IMPERIAL
MYCOLOGICAL INSTITUTE

THE IMPERIAL MYCOLOGICAL INSTITUTE
KEW, SURREY
1936

IMPERIAL MYCOLOGICAL INSTITUTE

PRINTED IN GREAT BRITAIN AT THE UNIVERSITY PRESS, OXFORD
BY JOHN JOHNSON, PRINTER TO THE UNIVERSITY

ERRATA

Page 26	line 15	for 'Michaelis (F.)'	read 'Michaelis (P.)'
	46	,, '*1935*'	,, '*1934*'
27	22	,, '*1935*'	,, '*1934*'
55	31	,, '*1935*'	,, '*1934*'
56	18	,, '*1935*'	,, '*1934*'
57	19	,, '*philippensis*'	,, '*philippinensis*'
64	43	,, '*Casimoroa*'	,, '*Casimiroa*'
76	28	,, 'anarca'	,, 'anauca'
93	32	,, '*ballagi*'	,, '*ballagii*'
159	21	,, '*laxi*'	,, '*laxa*'
160	37	,, 'Maclachan'	,, 'MacLachlan'
164	33	,, 'sulphide'	,, 'disulphide'
216	19	,, '*Locusta migratoria migratorioides*'	,, '*Nomadacris septemfasciata*'
	20	,, 'Massa'	,, 'Niassa'
257	5	,, '*koningii*'	,, '*koningi*'
264	28	,, '25 to 27'	,, '17 to 25'
346	9	,, '*vasculorum*'	,, '*albilineans*'
	10	delete 'West'	
394	36	for '10'	,, '109'
400	7	,, '*Garya*'	,, '*Garrya*'
444	21	,, 'xiv'	,, 'xiii'
482	32	,, 'mosami'	,, 'mosambi'
486	4	,, 'arsenic'	,, 'arsenite'
488	31	,, 'Johnston'	,, 'Johnson'
531	1	,, 'xv'	,, 'vii'
550	16	,, 'Gardner (W. M.)'	,, 'Gardner (M. W.)'
555	10	,, 'or'	,, 'in'
	39	,, '*G. album*'	,, '*Gloeosporium album*'
561	33	,, '*Agron.*'	,, '*Agric.*'
579	19	,, 'Dey (W. C.)'	,, 'Dey (N. C.)'
617	7	,, '*Blepharosphora*'	,, '*Blepharospora*'
672	44	delete '*calceolaria*'	
725	28	for 'xv'	,, 'xiv'
775	13	,, '*P.*'	,, '*Phytophthora*'
793	41	,, 'Edwards (E. J.)'	,, 'Edwards (E. T.)'
808	41	insert '*P. cinnamomi*:' before '*R.A.M.*'	

c
ınd a
they
ars,
town
eleas
also p
sapp
ıd fro
late
une
Guze
ırs v
anxi
and t
ortin
ıcem
Euro
joine
lingto
after
ı the
ses ki
a lar
racti
apitu

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW

OF

APPLIED MYCOLOGY

VOL. XV JANUARY 1936

NEUWEILER (E.). **Bericht über die Tätigkeit der Eidg. Landwirtschaftlichen Versuchsanstalt Zürich-Oerlikon für die Jahre 1932 und 1933–34. IV. Pflanzenschutz.** [Report on the work of the Federal Agricultural Experiment Station Oerlikon (Zürich) for the years 1932 and 1933–34. IV. Plant Protection.]—*Landw. Jb. Schweiz*, xlix, 5, pp. 557–562, 1935.

Wheat bunt [*Tilletia caries*] at Oerlikon, Zürich, was practically eliminated in 1932 and 1933–4 by treatment of the seed-grain with U. 564 [*R.A.M.*, xiii, p. 627] by the immersion and sprinkling methods, this preparation being unsuitable, however, for the short disinfection process. Helion [ibid., xiii, p. 11] failed to give adequate control. V. Casaburi (Naples) recommends the use of the following dusts at the rate of 2 kg. per 100 kg. seed-grain: iron salt BB (iron salt of a synthetic tannin with minute amounts of mercury, copper, and arsenic), dea (iron salt BB+paradichlor emulsion+talc and moisture), unitan (mercury salt BB+paradichlor emulsion+talc and moisture), and unidea (a blend of dea and unitan in the ratio of 1:1) [ibid., xiv, p. 114], but none of these was found to equal formalin either in bunt control or for stimulatory purposes.

In potato spraying [against *Phytophthora infestans*] in 1933–4 the yield was increased by 19·3, 23, 29, and 29 per cent., respectively, by treatment with cusisa [ibid., xiii, p. 11], Ob. 21 (Farbenindustrie, Leverkusen), cupro-maag [ibid., xiv, p. 701], and kukaka [ibid., xi, p. 694] as compared with 41 per cent. for home-made Bordeaux mixture.

Encouraging results in the control of heart and root rot of beets [ibid., xiv, p. 808] were obtained by the application of borax to the soil at the rate of 6 kg. per hect.

GALLOWAY (L. D.). **India: new plant diseases recorded in 1934.**—*Int. Bull. Pl. Prot.*, ix, 8, pp. 176–178; 11, p. 268, 1935.

Among other new phytopathological records collected in India during 1934 by the Imperial and Provincial Mycologists were a foot rot of sugar-cane seedlings caused by *Helminthosporium* sp. and stinking rot of the same host due to *Bacterium pyocyaneum* var. *saccharum* Desai, *Sclerotinia sclerotiorum* on maize, *Endothia* sp. on chestnut (*Castanea vulgaris*) (all at Pusa): mosaic of *Elettaria cardamomum*, controllable by

propagation through seed, foot rot of rice (*Fusarium moniliforme* var. *majus*) [*Gibberella fujikuroi*: *R.A.M.*, xiii, p. 323; xiv, pp. 254, 709], and damping-off of tobacco seedlings (*Pythium aphanidermatum*) [ibid., xiv, p. 473] (all in Madras); greasy spot (black melanose), a physiological disease of citrus, and *Cercospora personata* and *C. arachidicola* on groundnuts [ibid., xiii, p. 747] (Central Provinces); *Diplodia* [*Botryodiplodia*] *theobromae* on *Aleurites fordii*, and *Oidium 'erysiphoides'* [ibid., vii, p. 538; viii, p. 424] on mango (Burma).

[WALTERS (E. A.).] **Report on the Agricultural Department, St. Lucia, 1934.**—45 pp., 1935.

In the section of this report dealing with plant diseases (pp. 16–19) it is stated that during 1934 red root of limes (*Sphaerostilbe repens*) [*R.A.M.*, xii, p. 21] was discovered in St. Lucia in the Soufrière district. A survey throughout the Island showed that scattered infection was present in practically all the older orchards, the fungus was actively parasitic in poorly drained and non-aerated localities where root damage from periodical floods was evident, and passively saprophytic in the drier orchards. The issue to growers of limes budded on the resistant sour orange [*Citrus aurantium* var. *bigaradia*] stock was therefore increased to allow of rapid replanting in the severely affected areas.

Owing to continued dry weather there was no serious loss during the year from wither-tip of limes [*Gloeosporium limetticolum*: ibid., xiv, p. 84].

Thirty-seven cases of coco-nut bud rots [*Phytophthora palmivora* or bacteria: ibid., xi, p. 27] and 16 of little leaf [loc. cit.] were recognized and treated.

Surveys in all the districts of St. Lucia have now revealed fairly accurately the extent and danger of Panama disease of bananas [*Fusarium oxysporum cubense*]. In general, the lowland areas and older cacao lands are infected, but the new clearings on forest lands are likely to remain disease-free for a long period, provided that the planting material used is properly inspected and the land selected carefully and systematically treated. The disease was present to the extent of 1·2 per cent. of the total area under banana cultivation in 1934 (903 acres), but only 0·3 per cent. of the new plantings (203 acres) were affected.

A tabulated schedule is also given showing the plant quarantine regulations in force in the Island. In 1934, 160 inspections of plant imports were made and 55 consignments were confiscated or otherwise dealt with.

Protecting plants from diseases.—*Rep. Wis. agric. Exp. Sta. 1933–1934* (*Bull.* 430), pp. 15–32, 3 figs., 1935.

Much of the information in this report has already been noticed from other sources. Promising results in the control of apple and pear scab [*Venturia inaequalis* and *V. pirina*] and cherry leaf spot [*Coccomyces hiemalis*: *R.A.M.*, xiv, pp. 544, 706] have been obtained by G. W. Keitt and D. H. Palmiter by the application, shortly before autumn defoliation, of various copper-lime-arsenite mixtures [ibid., xiv, p. 381], which largely prevented the development of ascospores in the overwintering leaves. Late dormant applications killed the perithecia of the organisms causing black knot of cherry [*Dibotryon morbosum*: ibid.

xiv, p. 593] and spur blight of raspberry [*Didymella applanata*], and prevented the development of brown rot [*Sclerotinia fructicola*] conidia in fruits adhering to the trees after the previous year's infection. Used in dust form, copper-lime-arsenite proved somewhat more effective against wheat bunt [*Tilletia foetens*] than the copper carbonate and organic mercury preparations in common use.

Studies are in progress by A. J. Riker, J. G. Dickson, and R. O. Magie on the etiology of a destructive stalk rot of maize which is stated to be annually responsible for heavy losses. In 1934 the disease affected 89 per cent. of the plants in commercial stands, lodging being also observed in 20 per cent. of the cases.

Racine Market, a selection from Copenhagen Market cabbage resistant to yellows [*Fusarium conglutinans*] [ibid., xiv, p. 732], was extensively tested in Kansas and Wisconsin during 1934 and was generally approved by market-gardeners. The analysis by L. M. Blank and J. C. Walker of numerous progenies of the Wisconsin All Seasons cabbage revealed the occurrence of two types of resistance. Certain lines are completely resistant both in the field and in the greenhouse at a soil temperature of 75° F. The progenies of crosses between these and susceptible plants are also completely resistant (homozygous). Other lines are also entirely resistant in the field, but under greenhouse conditions a slight amount of disease appears in the progeny both from self-pollination and back-crossing.

Yellow dwarf of potatoes [ibid., xiv, pp. 147, and below, p. 42] was effectively combated by the use of certified seed [cf. ibid., xiv, p. 714]. Among the suggestions made by A. R. Albert, J. G. Milward, and J. C. Walker for the control of potato scab [*Actinomyces scabies*] are the use of the resistant Russet Rural and Russet Burbank varieties; the lapse of at least five years between liming and the next potato crop, with lucerne, maize, grain, and sweet clover [*Melilotus alba*] intervening; and seed disinfection.

K. Koch and J. Johnson found the mottle virus, which in combination with veinbanding produces rugose mosaic [ibid., xiv, p. 605], in potato samples imported from nine countries but in only about half of the 75 varieties represented.

MULLER (A. S.). **Brazil: some new diseases observed in the State of Minas Geraes in 1934.**—*Int. Bull. Pl. Prot.*, ix, 8, pp. 175–176, 1935.

The following are among the new phytopathological records collected during 1934 in Minas Geraes, Brazil: *Colletotrichum gloeosporioides* on *Averrhoa carambola*; *Corticium koleroga* [*R.A.M.*, xiv, p. 795] destroying a nursery bed of 10,000 coffee (*Coffea arabica*) seedlings at Herval; *Cercospora citrullina* on melon [ibid., x, p. 771]; and *Rhizoctonia* [*Corticium*] *solani* causing fruit rot of tomato [ibid., xiii, p. 349; xiv, p. 263] in rainy weather.

Enfermedades mas comunes de las plantas cultivadas. [Prevalent diseases of cultivated plants.]—Bulletin issued by Min. Hacienda Entre Rios, Dep. Agríc.-Gan., 35 pp., 7 col. pl., 1935.

Semi-popular notes are given on some well-known fungal and

for their control. In addition to the scientific designations of the pathogens, the names by which they are commonly known in the Argentine and abroad are given.

Burgwitz (G. K.). Фитопатогенные бактерии. [Phytopathogenic bacteria.]—252 pp., Издат. Акад. Наук СССР [Publ. Off. Acad. Sci. U.S.S.R.], Leningrad, 1935.

In its main part this monograph is a compilation from the literature of technical descriptions of phytopathogenic bacteria, with the indication of their hosts and geographic distribution. The author follows K. B. Lehmann's and R. O. Neumann's classification (*Bakteriologie*, ii [7th Ed., xi+876 pp., München, J. F. Lehmann], 1927) based on the morphology of the organisms, *Bacterium* including non-sporulating, straight or slightly curved but never sinuous, motile or non-motile rods, mainly Gram-negative, and *Bacillus* including sporulating, mainly Gram-positive rods with peritrichous flagella. The organisms are divided into three groups, the first comprising 184 species which have been studied more or less fully; the second, 26 species, the description of which is not yet complete; and the third, 81 species, the pathogenicity of which to plants has not yet been satisfactorily established. Bibliographical references are given after the account of the individual species, and the book terminates with an alphabetical list of all the species enumerated, with the indication of their authors and hosts, and a host index arranged according to the systematic position of the hosts, with a brief characterization of the diseases caused by the various pathogens.

Bact. maculicolum McCulloch, 1911, is regarded as being antedated by *Bact. maculicolum* (Delacroix, 1905) Stapp, 1928 [*B. maculicola* Delacr.—*C. r. Acad. Sci., Paris*, cxl, 1905], and is renamed *Bact. maccullochianum*. *B. vitis* Merjanian & Kovaleva, 1930 [*R.A.M.*, x, p. 772], is antedated by *B. vitis* Montemartini, 1913, and is renamed *B. viticola*. *B. papaveri* Christoff, 1932 [ibid., xiii, p. 307], is renamed *Bact. papaverum*, this specific name being preferred to avoid confusion with *B. papaveris* Ram Ayyar, 1927. *Bact. puerariae* [ibid., vii, p. 585] is cited as a synonym of *Bact. medicaginis* var. *phaseolicola*, *Bact. exitiosum* Gard. & Kend., 1921 of *Bact. vesicatorium* Doidge, 1920 [ibid., xiv, p. 681], and *Bact. viridifaciens* [ibid., iii, p. 124] of *Bact. vignae* [ibid., ii, p. 486].

Pugsley (A. T.), Oddie (T. H.), & Eddy (C. E.). **The action of X-rays on certain bacteria.**—*Proc. roy. Soc.*, Ser. B, cxviii, 808, pp. 276–298, 5 graphs, 1935.

The authors utilized *Phytomonas* [*Bacterium*] *medicaginis* var. *phaseolicola* [*R.A.M.*, xiv, p. 733] with *Bacillus coli* [ibid., xii, p. 426] and *Sarcina lutea* for an elaborate study on the action of X-rays on bacteria, the results of which are given in great detail. X-rays (0·25–2 Å) kill the three organisms in the following order of increasing sensitivity: *S. lutea*, *B. coli*, and *Bact. medicaginis* var. *phaseolicola*, the relative sensitivities being about 0·3, 1, and 3.

DUYFJES (H. G. P.). **Het problem der actieve immunisatie van planten tegen Pseudomonas tumefaciens Smith en Town.** [The problem of the active immunization of plants against *Pseudomonas tumefaciens* Smith and Town.]—*Proefschr. Univ. Utrecht*, 100 pp., 9 pl., 1935.

The results [which are fully discussed, the relevant data being tabulated] of inoculation experiments with strain 245 of *Pseudomonas* [*Bacterium*] *tumefaciens* from pear, maintained on malt agar since 1932 at the 'Willie Commelin Scholten' Phytopathological Laboratory, Baarn, on *Ricinus communis* var. *major*, *Bryophyllum crenatum*, *Impatiens balsamina*, and *Pelargonium zonale* (Miss Calvin variety) [*R.A.M.*, xiv, pp. 430, 499, 565] showed that this strain is exceptionally virulent, producing 100 per cent. infection as a result of needle inoculations. No apparent influence on the size of the tumours resulting from inoculation was exerted even by very considerable variations in the numbers of bacteria composing the inoculum.

It was observed in preliminary tests on *R. communis* var. *major* seedlings that the aptitude of the hypocotyl for tumour production decreases *pari passu* with its longitudinal growth after a given moment, probably at the inception of cell extension, of intense reaction to infection by the crown gall organism. No differences in susceptibility could be detected between flowering plants of *P. zonale* and those forcibly prevented from blooming [ibid., x, p. 779]. It was possible, however, to induce enhanced resistance to *Bact. tumefaciens* in *P. zonale* cuttings by immersing the cut ends for a period of 12 days in the diluted culture solution of living cultures of the organism grown on an unfavourable synthetic liquid medium; there was some indication that the solution also stimulated root formation by the host. It was further observed that the presence of a tumour on this host automatically inhibits, to a greater or lesser extent, the formation of a second tumour from a subsequent inoculation. Cut leaves of *B. crenatum*, treated with *Bact. tumefaciens* in a similar manner to *P. zonale*, reacted by some degree of stunting of the newly formed plants, but when transferred to soil they showed reduced susceptibility to crown gall, as also did a few shoots that developed in the leaf axils as a result of inoculation below the latter. Mutual inhibition of growth was caused by the tumours resulting from simultaneous inoculations in various internodes of a large number of *R. communis* var. *major* plants. *Bact. tumefaciens* was recovered from the tumours and the stems on which they were formed, but on reinoculation into *R. communis* var. *major* only a small proportion of large tumours was obtained, indicating that this highly virulent strain had undergone a very considerable weakening (reflected in the predominance of rough forms isolated) [ibid., xi, p. 226 *et passim*] by passage through the plants. The formation of rough variants was also a characteristic feature of cultures on the above-mentioned unfavourable synthetic medium, whereas not the slightest inequalities were observed in pure cultures of strain 245 of *Bact. tumefaciens* in congenial substrata, such as malt or bouillon agar, liquid malt, or liquid bouillon. This strain was found to be infected by a bacteriophage [ibid., xiii, p. 152], the lytic action of which was stronger after passage through *R. communis* var. *major*, *P. zonale*, and *I. balsamina* plants than when isolated direct

Pflanzenschutzmittelverzeichnis des Deutschen Pflanzenschutzdienstes 1935–36. Mittel für Saatgutbeizung. [List of plant protectives of the German Plant Protection Service 1935–36. Preparations for seed-grain disinfection.]—*Biol. Reichsanst. Land- u. Forstw. Berl.-Dahl., Merkbl.* 7 (11th Ed.), 2 pp., 1935.

An alphabetical list is given of the seed-grain disinfectants officially recommended by the German Plant Protection Service for the control of wheat bunt [*Tilletia caries* and *T. foetens*], snow mould of rye [*Calonectria graminicola*], stripe disease of barley [*Helminthosporium gramineum*], and loose smut of oats (*Ustilago avenae*) [*R.A.M.*, xiv, p. 380].

Bennett (F. T.). **Fusarium species on British cereals.**—*Ann. appl. Biol.*, xxii, 3, pp. 479–507, 2 pl., 9 figs., 1935.

Continuing his investigations of species of *Fusarium* on cereals in Great Britain [*R.A.M.*, xii, p. 754], nearly 30 of which have been isolated so far, the author gives details of the morphological, cultural, and pathogenic characteristics of *F. herbarum* [ibid., xiv, pp. 571, 709], *F. herbarum* f. 2 Wr, *F. equiseti* [ibid., xiii, p. 613], *F. equiseti* f. 1 Wr, *F. sambucinum* [ibid., xiii, p. 261], *F. sambucinum* f. 1 Wr, *F. trichothecioides* [ibid., viii, pp. 486, 520], *F. tricinctum*, and *F. merismoides* var. *majus* Wr [ibid., xi, p. 624], with drawings of each species. Experimental evidence was obtained that *F. herbarum* is capable of causing under favourable conditions a seedling blight, and under normal conditions a mild but persistent foot rot of wheat, resulting in reduced yield of straw and grain. In the field it is one of the commonest species on dead or unhealthy crop plants, often on the straw and glumes of cereals. A similar mild foot rot was caused in trials under normal conditions by *F. equiseti* in wheat, barley, and oats, as well as an obscure ear blight of wheat and barley; grains from inoculated ears showed a reduction of germination of from 25 to 75 per cent. and there were indications that the fungus is carried internally by the seed. The same applies to *F. equiseti* f. 1, except that in moist weather the symptoms caused by it on wheat and barley ears are more obvious; while not destructive as a seedling blight or foot rot organism it causes considerable loss by reduction of germination capacity and yield of grain. *F. equiseti* was found by the author associated with wheat and barley foot rot and its f. 1 on the underground parts of wheat, barley, and oats. In one year trials *F. sambucinum* f. 1 and *F. tricinctum* appeared to be of little, if any, importance as a cereal foot rot organism. The pathogenicity of the other forms was not investigated.

Verwoerd (L.). **The distribution and prevalence of physiologic forms of Puccinia graminis tritici in the Union of South Africa, 1930–1934.**—Reprinted from *Ann. Univ. Stellenbosch*, xiii, Sect. A, 3, 7 pp., 1935.

A comprehensive survey carried out in South Africa from 1930 to 1934 failed to reveal the presence of any new physiologic forms of *Puccinia graminis tritici* [*R.A.M.*, xi, p. 230], while of those already known, 13, 29, 98, and 100 were not found again. Form 99, previously

different occasions from wheat and once from *Lolium italicum*. Form 21 was collected in Cape Province once in 1930 and again in 1932. Form 34, which is widely distributed and was the prevailing form each year of the survey, occurred in 95·9 per cent. of the total collections determined; it was very seldom found mixed with others. Form 38, the second commonest form, has been isolated only on 33 occasions since first found in 1922; this figure represents 3·4 per cent. of the collections made during the survey.

MONTEMARTINI (L.). **Eccitabilità di organismi ammalati.** [The response of diseased organisms to stimulation.]—*Riv. Pat. veg.*, xxv, 7–8, pp. 293–303, 1935.

After briefly reviewing the results obtained in recent studies on the morphological, anatomical, and physiological effects of the infection of cereals by *Tilletia* and *Ustilago* spp. [*R.A.M.*, xi, pp. 502, 630, 631; xii, pp. 209, 558 *et passim*] the author describes his investigations on the action of latent infection by *T. tritici* [*T. caries*] and *U. tritici* on the phototropic and geotropic response of wheat.

Mentana wheat seed inoculated with *U. tritici* by Milan's method [ibid., xiii, p. 361], or with *T. caries* by Reed's method [ibid., iv, p. 343] or untreated, was sown in pots, and when the shoots had emerged rather more than 1 cm. above soil level the pots were exposed to unilateral light. The seedlings were then planted in the open and just before earing were pressed down horizontally to test the geotropic reaction. Finally, all the plants were examined for the presence of infection.

The results obtained showed that of 34 plants infected with *U. tritici*, 22 and 4 were among those which exhibited the most marked phototropism and geotropism, respectively; of 7 plants infected with *T. caries*, 5 were among the most phototropic and none amongst the most geotropic.

Latent infection, therefore, apparently increased the sensibility of the plants to light but reduced that to gravitation.

MITRA (M.). **Stinking smut (bunt) of Wheat with special reference to Tilletia indica Mitra.**—*Indian J. agric. Sci.*, v, 1, pp. 1–24, 7 pl., 2 graphs, 1935.

Wheat bunt (*Tilletia caries*, *T. foetens*, and *T. indica*) [*R.A.M.*, xiv, p. 80] is confined to the north-west of India, the first two species to the cooler regions, and the last-named to the plains. Among other characters *T. indica* is distinguished from the other two species by its black spore mass. A biometric analysis of the data obtained in a comparison of the spore sizes of two collections of *T. caries* from emmer and durum wheat supplied by Brentzel [from United States: ibid., xii, p. 618], a collection of *T. caries* from Gilgit, Kashmir, and two collections of *T. indica* from Karnal and Peshawar showed that the range of spore length and width in the emmer strain was 12 to 25 by 12 to 23 (average 18·3 by 17·1) μ, in the durum strain it was 15 to 28 by 15 to 22 (average 19·1 by 17·3) μ, and in the Gilgit strain 18 to 30 by 18 to 24 (average 22·5 by 20·7) μ. The range in the Karnal collection of *T. indica* was 25 to 55 by 22 to 42 (average 37·9 by 32·5) μ, and in the

Peshawar collection 27 to 46 by 27 to 44 (average 36·2 by 34·7) μ. These figures show that the spore sizes of *T. indica* are almost double those of *T. caries*, and on the basis of the differences of mean spore measurements, which are statistically significant, the author regards the collections as representing three physiologic forms of *T. caries* and two of *T. indica*. Inoculation studies have not yet been carried out.

Wheat grain naturally infected by *T. indica* yielded healthy plants at Pusa but infected ones at Karnal, and Pusa seed sown at Karnal gave a healthy crop, a difference in behaviour which is accounted for by variations in climatic conditions.

Experiments on control of the disease showed that seed treatment with uspulun universal, copper carbonate, ceresan, and formalin reduced infection but did not check the disease altogether.

Leeper (G. W.). **Manganese deficiency of cereals: plot experiments and a new hypothesis.**—*Proc. roy. Soc. Vict.*, xlvii (N.S.), 2, pp. 225–261, 2 graphs, 1935.

Wheat plants growing on a heavily limed soil at Melbourne University have been found to suffer from lack of available manganese [*R.A.M.*, xiv, p. 122], a deficiency that may be corrected, as shown by experiments on the Federation and Free Gallipoli varieties, by acidification of the soil, preferably by means of sulphur, to at least P_H 6·5, or by heavy applications of manganous sulphate to the soil. The former treatment failed to improve the early growth or late tillering of the plants, but it increased the number of grain-bearing ears, the number of grains per ear, and the weight per grain. Powdered manganese sulphate gave the best results at the rate of 1 cwt. per acre, either sown with the seed or applied to the soil at germination, a residual effect being observed a year later [ibid., xiii, p. 676; xiv, p. 575]; the plots so treated, however, did not equal those acidified by sulphur. In laboratory tests manganese-deficient soils yielded under 15 parts of manganese per million of soil on leaching with normal ammonium acetate and 0·2 per cent. quinol [hydroquinone] solution at P_H 7, while healthy soils gave over 130 parts. It is suggested that the plant uses manganese dioxide as its source of manganese, either directly in the colloidal state or by reduction at the root-soil interface, and it is only the manganese dioxide dissolved by quinol at P_H 7 that can be so utilized, and not the more copious supply soluble under certain conditions with or without quinol at low P_H values (1 to 2). Where sulphuring is impracticable, e.g., on highly calcareous soils, an 'active', finely divided manganese dioxide should prove equally valuable with manganese sulphate in the control of manganese deficiency.

Vanderwalle (R.). **Contribution à l'étude du mécanisme de l'action de la chaleur dans la désinfection anti-charbonneuse des semences de céréales.** [A contribution to the study of the mechanism of the action of heat in the anti-smut disinfection of cereal seed-grain.]—*Bull. Acad. Belg. Cl. Sci.*, Sér. 5, xxi, 7, pp. 759–765, 1935.

After carefully disinfecting a batch of barley seed-grain against loose smut (*Ustilago nuda*) by the standard hot water treatment ($3\frac{1}{2}$ hours pre-soaking followed by 10 minutes' immersion in water heated to

52° C.) [*R.A.M.*, xii, p. 280; xiv, pp. 431, 745], the writer removed the bracteal sheaths covering the embryo and, by means of Péterfi's micromanipulator, introduced through a glass micropipette a mycelial suspension of the fungus originating in a diploid monospore culture, the technique of the process being described. The plants developing from the inoculated seeds were smutted, indicating that *U. nuda*, normally a floral parasite, is capable under favourable circumstances of attacking the embryo. The author considers that the hot water acts directly on the latent mycelium in the embryo, while the pre-soaking process contributes to the efficacy of the method either by the augmentation of thermic conductibility or by stimulating the vitality of the mycelium and thereby increasing its sensitiveness to heat.

LEEMANN (A. C.). **Barley stripe disease.**—*Fmg S. Afr.*, x, 110, pp. 207–208, 3 figs., 1935.

Stripe disease of barley (*Helminthosporium gramineum*) does not ordinarily cause very heavy damage in South Africa [*R.A.M.*, x, p. 373], but in 1934 thousands of acres are reported to have been destroyed in the Alexandria district. The symptoms of the disease and the mode of infection are briefly described, with notes on predisposing conditions. Experiments on the Alexandria farms showed that crop rotation with maize is a sure means of promoting stripe infection, the incidence of which may be reduced by seed treatment with tillantin R, agrosan [see below, p. 13], or germisan. Legumes should be substituted for maize in the rotation, and the ploughing-under of diseased plants and grazing over the infested areas should be avoided.

BRIGGS (F. N.). **Inheritance of resistance to mildew, Erysiphe graminis hordei, in a cross between Hanna and Atlas Barley.**—*J. agric. Res.*, li, 3, pp. 245–250, 1935.

After stating that barley mildew (*Erysiphe graminis hordei*) is common in California, and is especially destructive to the late-sown crop, the author gives a brief, tabulated account of his studies in 1933 and 1934 at Davis, in that State, of the inheritance of resistance to form 3 of the mildew in a cross between Hanna (completely resistant) and Atlas (highly susceptible) barleys [*R.A.M.*, x, p. 176; xiv, pp. 92, 689]. The behaviour of the F_2 and F_3 progenies indicated that Hanna differs from Atlas in one factor for resistance, and that susceptibility is incompletely dominant. There was no evidence of linkage between mildew resistance and the factor pairs responsible for six-rowed as against non six-rowed ears, and for long-haired as against short-haired rachillae.

PETERSUN (B.). **Physiologic specialization in Puccinia coronata avenae.**—*Sci. Agric.*, xv, 12, pp. 806–810, 1935. [French summary.]

Crown rust of oats (*Puccinia coronata avenae*) [*P. lolii*], though of considerable importance in Eastern Canada does not usually cause appreciable damage in Manitoba and Saskatchewan, except where oats are grown in proximity to buckthorn (*Rhamnus cathartica*) hedges, although it was epidemic there in 1927, and is of minor importance in Alberta and British Columbia. The author gives a brief, tabulated account of his studies on physiological specialization of the rust in

Canada by means of the 11 standard differential hosts determined by him in agreement with H. C. Murphy [*R.A.M.*, xiv, p. 435]. The 544 collections of the rust in Eastern and Western Canada which were studied in the greenhouse from 1929 to 1934 were found to comprise 11 distinct physiologic forms, the reaction of which on the differential hosts is shown in an analytical key for their identification. Some of the forms (viz., 1, 2, 3, and 4) were found to be of common occurrence and to have recurred in each of the years reviewed, while others were rare (forms 5, 9, A, and B, with only 1, 3, 2, and 1 collections, respectively) or only appeared for one season (e.g., form 10 with 15 collections in 1929). Some of the forms, notably 1, 2, 3, 4, and 6, occurred both in Eastern and Western Canada, and while their relative prevalence varied considerably from year to year, forms 1 and 4 were in general much more common in Western than in Eastern Canada, the reverse being true of form 2; forms 3 and 6 were about equally prevalent in both areas.

Miles (L. E.). **New discoveries in relation to seed treatment which further emphasize the need for treating.**—*Agric. News Lett.*, iii, 8, pp. 7–9, 1935. [Mimeographed.]

Tests with twelve different lots of oats in Illinois, North Dakota, and Minnesota in 1933 showed that seed-grain treatment with ethyl mercury phosphate (new improved ceresan) [*R.A.M.*, xiv, p. 745 and next abstract] increased the yield by over 10 per cent. In the same year mercury-treated spring wheat out-yielded the untreated control lots by nearly 5 per cent. The stimulatory action of the disinfectant appears to be partially, or in some cases wholly, independent of the control of oats and wheat smuts [*Ustilago avenae* and *U. kolleri*, and *Tilletia foetens*, respectively], which were not an important factor in this series of experiments, the average amount of infection in 47 tests on oats being 7·4 per cent., whereas the increase of yield of the ceresan-treated seed was nearly 21 per cent., while in 9 and 15 wheat tests there were average increases in yield of 8·5 and 5 per cent., respectively, with only a trace of smut in the former tests and none in the latter.

Briefly discussing the reasons for these beneficial results, the writer thinks they are to be sought in the elimination from the treated material of parasitic seed- and soil-borne organisms rather than in a direct stimulus to plant growth, convincing evidence of which does not appear to be forthcoming. It has been shown in laboratory trials that the growth rate of seedlings from treated seed-grain exceeds by from 5 to 20 per cent. that of those from the controls, which are commonly overrun by moulds, the adverse effect of these on plant development being thus conclusively demonstrated.

Barbee (O. E.). **Markton and other varieties of Oats.**—*Bull. Wash. agric. Exp. Sta.* 314, 44 pp., 3 figs., 13 graphs, 1 map, 1935.

In trials to determine the reaction of the Markton variety of oats (stated to be almost exclusively grown in the eastern part of Washington) and a number of others to smut (*Ustilago levis*) [*U. kolleri*: *R.A.M.*, iv, p. 87; xiv, p. 436], the range of resistance (computed by Gaines's method) [ibid., v, p. 289] in the hulled group was from 29 per cent. for

Aurea to 100 for Markton, and in the hull-less from 4 per cent. for Chinese to 100 for hybrids between hull-less varieties (Chinese and Liberty) and Markton. Another very susceptible variety was Anthony (40 per cent. resistance), whereas complete immunity (100 per cent. resistance) was shown by Banner×Markton, and Red Rustproof, in addition to those already mentioned. The formaldehyde dip method of seed-grain treatment has given the best control of *U. kolleri* under local conditions, but the same preparation may also be used in the sprinkle, spray, or dust forms, or improved ceresan [see preceding abstract] may be applied at the rate of ½ oz. per bushel. Treatment of Markton is superfluous, and this variety may be sown at the rate of only 50 to 60 lb. per acre compared with 90 for the others enumerated.

DERICK (R. A.) & FORSYTH (J. L.). **A study of the causes of 'blast' in Oats.**—*Sci. Agric.*, xv, 12, pp. 814–824, 1935. [French summary.]

After giving a brief review of recent work on the condition in oats known as 'blast' or 'blindness' [*R.A.M.*, xi, p. 363], the results of which indicated that the disease is probably of a physiological nature, the author states that greenhouse and laboratory experiments started in 1932 at the Central Experimental Farm, Ottawa, have shown that its development is related to environmental conditions such as soil moisture, light, and nutrition. From a practical standpoint, the investigation appeared to show that the critical period for blast development is from six to eight weeks following sowing, the length of the period varying with the moisture supply during the early development stages of the oat seedlings. Excess water was effective in reducing the percentage of blast under field conditions from 23·4 to 19·4, while reduced water supply increased it to 36·5; corresponding percentages for the greenhouse experiments were 62·6, 49·2, and 64·9. Light had some influence in blast development, excess light increasing the percentage of plants affected from 62·6 to 70·6 while reduced light increased it to 66·1; combined with sub-normal water supply the figures were 64·9, 71·2, and 66·8 and with excess water 49·2, 67·3, and 55·4. Late sowing increased the development of blast, and late tillers were found to be more susceptible to the condition than earlier ones, presumably owing to lessened water supply and greater light intensity at the critical period. Statistical analysis did not show a significant correlation between percentage blast and total spikelet number.

LEPIK (E.). **On occurrence of ergot (Claviceps) in Estonia.**—*Rep. Phytopath. Exp. Sta. Tartu* [*Dorpat*] 26, 13 pp., 1935.

This is a briefly annotated list of 52 species and varieties of Gramineous plants which have been recorded up to date in literature or found by the author as hosts of the five species of *Claviceps* occurring in Esthonia. *C. purpurea* was collected on 42 of these hosts.

SMITH (G. M.). **Incidence of bacterial wilt in experimental plantings of Sweet Corn at Lafayette, Indiana, in 1934.**—*Plant. Dis. Reptr*, xix, 12, pp. 204–208, 1 graph, 1935. [Mimeographed.]

In comparative experimental plantings of sweet corn [maize] (*a*) on sandy loam with a gravel subsoil and (*b*) on a silt loam with a fairly

heavy subsoil near Lafayette, Indiana, in May, 1934, the losses from bacterial wilt [*Aplanobacter stewarti*: *R.A.M.*, xiv, p. 752] on the former were practically negligible (from 0 in 69 strains, to 12·1 per cent., average 1·6 per cent.), except in the highly susceptible Early Crosby variety, whereas in the latter they ranged from 1·5 per cent. in Black Mexican to 63·3 per cent. in Early Crosby (average 15 per cent.). The average loss from the disease for the State as a whole would probably not exceed 5 per cent. Several cases were observed which failed to confirm the accepted view that the earlier types are more susceptible to wilt than the later ones, though in general the latter tend to be slightly more resistant. Early Crosby, however, with the highest average loss (50·5 per cent. plants killed), was one of the latest in the trials, whereas the very early Spanish Gold showed a low percentage of destruction (6).

RANNINGER (R.) & LERNER (E.). **Saugkraft und Brandanfälligkeit bei Mais.** [Osmotic pressure and smut susceptibility in Maize.]—*Landeskultur*, ii, 10, pp. 187–188, 1935.

The maize season of 1935 in the drier parts of Austria was characterized by a reduced yield of fodder maize (only about one-third of the normal) and an exceptionally severe outbreak of smut [*Ustilago zeae*: *R.A.M.*, xiv, p. 750]. At the Weigelsdorf Agricultural School in Lower Austria, breeding for the production of varieties suitable for ensilage under dry climate conditions is in progress, the seed being tested for its osmotic pressure. It has been found that the plants from seed with high osmotic pressures have grown extremely well even in very dry seasons, but in the last season these were the plants that suffered most from smut. An extensive table is given showing that in over 4,000 plants examined the percentage infection in the high osmotic pressure series was 22·43, the corresponding figures for plants from seed with medium and low pressures being 9·24 and 8·87, respectively. The difference in the incidence of the disease was evident even when the seed showing the different grades of osmotic pressure came from the same ear. In a control plot of similar origin, but in which the osmotic pressure had not been tested, the percentage infection was 14·41. Most of the smut sori formed on the stem (33·4 per cent. on the lower part, 23·8 per cent. in the middle, and 26·3 per cent. on the upper part) and it is possible that the incidence of infection is correlated with the more luxuriant growth and larger stem and leaf development of the plants in the high osmotic series.

NEILL (J. C.) & BRIEN (R. M.). **Experiments on the control of pink cob-rot of Maize.**—*N.Z. J. Agric.*, li, 2, pp. 65–69, 1 fig., 1935.

Severe losses are caused from time to time in the Poverty Bay and Bay of Plenty districts of New Zealand by a dry rot of maize cobs constantly associated with a fungus identified at the Imperial Mycological Institute as *Fusarium moniliforme* var. *subglutinans* [*Gibberella fujikuroi* var. *subglutinans*: *R.A.M.*, xiv, p. 15].

Experimental evidence showed that infected seed could be disinfected with little injury to germination by dipping for 10 minutes in water held at 138° to 142° F. Plants grown in sterile sand from in-

fected seed dusted with agrosan G or ceresan new (each at 2 oz. per bush.) [ibid., xiii, pp. 566, 570] or steeped for 1 or 2 hours in uspulun 0·25 per cent. remained practically free from root lesions, though corresponding plants from untreated seed were severely infected.

The amount of cob rot developing in the field, however, was unrelated to the amount of infection on the seed, heavily and lightly infected seed producing equal numbers of diseased cobs, while heavily infected seed in one locality produced fewer diseased cobs than disinfected seed in another. The field germination of lightly infected seed was much above that of heavily infected seed, and was much improved by dusting with agrosan G or ceresan.

The most practical means of controlling the cob rot consists in eliminating the sources of air-borne infection by burning all maize refuse and in crop rotation. Seed dusting with agrosan G or ceresan, costing about 5*d.* per bush., largely controlled seedling mortality from the disease.

BITANCOURT (A. A.). **As doenças de virus dos Citrus.** [Virus diseases of Citrus.]—*Biologico*, São Paulo, i, 8, pp. 255–262, 1 pl., 1935. [English summary.]

The author states that comparative studies, based on the relevant literature and on his own observations, have shown the considerable analogies presented by the symptoms caused on citrus trees by psorosis, leprosis, ring blotch, and zonate chlorosis [cf. *R.A.M.*, xiv, p. 505], and would tend to confirm the view that these diseases are due to virus agencies, though this has not yet been conclusively demonstrated. While in general the lesions produced by all four diseases show great similarity on the various organs attacked (green shoots, woody twigs and stems, leaves, and fruits) [as indicated in the brief descriptions given], local differences do exist, but more of degree than of quality. Thus, while psorosis in the United States causes numerous and conspicuous lesions on the bark of woody branches, such lesions were seen for the first time in 1934 on grapefruit trees affected with zonate chlorosis and appear to be rare in Brazil; the identity of the latter disease with the former is indicated by the similar leaf lesions caused by the diseases in the two countries, though in the United States the lesions are much rarer than in Brazil. Fruit spots are relatively rare and of minor economic importance in ring blotch and psorosis, while they are abundant and cause appreciable losses in leprosis and zonate chlorosis. Certain points of resemblance between these diseases and the Navel orange spot described by Shamel, Pomeroy, and Caryl [*J. agric. Res.*, xxvii, pp. 521–526, 1924] and shown to be transmissible by budding, brown spot of Navel oranges [*R.A.M.*, xiv, p. 505], and some types of storage spot, also point to the possibility that these troubles, which hitherto were attributed to physiological causes, may eventually be proved to be due to virus agency.

PARISI (E.). **Per la conoscenza della gomma del Limone.** [A contribution to the knowledge of the gum of the Lemon.]—*Ann. Chim. appl., Roma*, xxv, 5, 230–236, 1935.

Among the products of hydrolysis of the gum exuded by lemon trees

at the Milan Agricultural College the following were identified: ara-binose, galactose, small amounts of a methyl-pentose, and uronic acid (closely related to vitamin C). Neither glucose nor xylose, the principal degradation products of the cell-walls and wood, was detected. Hence it appears reasonable to infer that the gum is not a product of enzymatic action on the cell-walls of the diseased tissues but a concomitant either of the metabolism of the micro-organisms associated with the disturbance (chiefly *Phytophthora citrophthora*) [*R.A.M.*, xii, p. 565; xiv, p. 692] or of the hydrolysis of certain constituents of the plant which are almost or quite devoid of materials breaking down into glucose and xylose.

ARRILLAGA (J. G.). **The nature of inhibition between certain fungi parasitic on Citrus.**—*Phytopathology*, xxv, 8, pp. 763–775, 2 figs., 1935.

In mixed cultures at 25° to 28° C. of *Diaporthe citri* and either *Phytophthora parasitica* or *P. citrophthora* [*R.A.M.*, xiv, p. 754 and preceding abstract] isolated from citrus fruits in Porto Rico, not only was the growth of the *P.* spp. arrested but conspicuous morphological and physiological disturbances were produced in the mycelia, which branched profusely, assuming a witches' broom aspect, and showed a tendency to abnormal reproductive activity. *P. citrophthora* under these conditions formed oogonium-like bodies, 17 to 27 μ in diameter, staining orange-yellow with eosin, the development of which is attributed to the emission by *D. citri* of a diffusible, filterable substance, thermostable at 110° C. and therefore non-enzymatic, presumably associated with the metabolic products of the fungus, exerting a specific stimulus on the *Phytophthora* mycelium. The foregoing effects were reproduced in a series of inoculation experiments on oranges, lemons, and grapefruit.

MARCHIONATTO (J. B.). **Argentine Republic: new studies on the 'lepra explosiva' of the Orange.**—*Int. Bull. Pl. Prot.*, ix, 8 pp. 173–175, 1935.

Discussing the etiology of the destructive orange disease known in the Argentine as 'lepra explosiva', the author maintains that there is no evidence to implicate the reputed agents, *Amylirosa aurantiorum* [*R.A.M.*, xiv, p. 793] or *Cladosporium herbarum* var. *citricolum* [ibid., xi, p. 223] in its causation. Physiological factors are also excluded, since the condition has been artificially reproduced by inoculation with the expressed sap of affected plants, and it is thought that the disease may be due to a virus. Two common forms of 'lepra explosiva' have been observed, namely, the more frequent chronic disturbance, which does not kill the plant but weakens it excessively, and an acute phase resulting in death within two to five years. In addition to direct injury in the form of desiccation of the twigs and shoots, defoliation, and deterioration or shedding of the fruit, the disease paves the way for infection by *Colletotrichum gloeosporioides* [ibid., xiv, p. 754] and other pathogens. A measure of control may be achieved by the removal of diseased material, supplemented by spraying with Bordeaux-oil emulsion; studies on internal therapy are in progress.

VARGHESE (K. M.). **Diseases of the Coconut Palm.**—Bulletin issued by Dep. Agric. Fish. Travancore, 105 pp., 9 pl., 1934. [Received September, 1935.]

The observations in this semi-popular bulletin on plant diseases in general (Section I) and of the coco-nut in particular in Travancore (II) and other countries (III) are stated to be based mainly on the data accumulated by previous workers in the same field, supplemented by the writer's recent experience. The coco-nut diseases described from Travancore are bud rot (*Phytophthora palmivora*); leaf rot or bitten leaf [*R.A.M.*, iv, p. 734], associated in the West Indies with *Thielaviopsis* [*Ceratostomella*] *paradoxa* [ibid., x, p. 161; xi, p. 27; xiv, p. 145], but apparently due under local conditions to an as yet unidentified fungus; leaf blight (*Pestalozzia palmarum*) [ibid., xi, p. 780]; leaf stalk rot, the causal organism of which also remains undetermined, characterized by symptoms closely resembling those attributed in the West Indies to *P. parasitica* [Ashby, *West Indian Bull.*, xviii, p. 70, 1920]; fruit rot or mahali (*P. omnivora*) [*P. arecae*: ibid., iii, p. 570; iv, p. 165; x, p. 755 *et passim*]; stem bleeding (*C. paradoxa*) [ibid., xii, p. 76]; and wilt, believed from the erratic spread of infection and other features suggestive of parasitic activity to be of fungal or virus origin, the exact nature of which it is hoped to determine by the investigations now proceeding.

BLISS (D. E.). **Soil disinfection as a means of combating decline disease in Date Palms.**—*Twelfth Ann. Rep. Date Growers' Inst.*, pp. 13–16, 1935.

The infectious nature of the Californian date palm decline disease associated with a species of *Omphalia* [*R.A.M.*, xiii, p. 694] was shown by the increase in the number of diseased palms in one garden from 1 in 1921 to 31 in 1928, and 59 in 1934, and by a similar progress in four others. The diseased areas enlarge in all directions for an indefinite period at rates up to 30 ft. or more a year.

The fungus was found in the roots of a severely stunted, nine-year-old Deglet Noor palm up to, but never exceeding, a distance of 4 ft. from the trunk and down to 4 ft. below the soil surface, at which depth it was comparatively rare, though abundantly present in the upper two feet of soil round the base of the tree.

Of various soil treatments tried semesan applied to seedlings growing in inoculated soil in 5 gall. containers at the rate of 1 lb. per 20 ft. tree-square in three equal doses at intervals of one week gave 22·2 per cent. diseased plants, as compared with 35·3 per cent. in the inoculated but otherwise untreated controls; copper sulphate (50 lb.) was ineffective, and a heavy application of fertilizers containing available nitrogen, phosphorus, and potassium greatly increased infection.

In another experiment sterilized segments of healthy date palm roots inoculated with *Omphalia* sp. were buried in unsterilized soil in containers at depths ranging from 1 to 21 in. The soil in each receptable was then given a basic or a double dose of carbon bisulphide, formaldehyde, tetrachlorethane, or chloropicrin poured in through a hole, the basic doses being, respectively, 0·5 fluid oz., 2 galls. 1 per cent. formalin,

0·242 and 0·169 fluid oz. per sq. ft. of soil surface. One month later, *Omphalia* sp. was recovered from all the date roots in the untreated controls but from none in the soil given carbon bisulphide or chloropicrin. The basic doses of formaldehyde and tetrachlorethane had practically no lethal effect, though the double doses were partially effective.

Soil disinfection with carbon bisulphide against date decline has been practised in California for over a year, the diseased palms being removed and destroyed and the disinfectant poured into holes 18 in. deep, which are immediately closed; the soil is then watered if possible and covered over for about two or three weeks, when new shoots can be planted. It is too early as yet to judge the efficacy of this treatment.

Trichoderma lignorum [cf. ibid., xiv, p. 248] applied to infected potting soil, the P_H value of which was uncontrolled, failed to prevent infection of seedling palms.

MALLAMAIRE (A.). **Sur quelques pourridiés en Côte d'Ivoire.** [On some root rots in the Ivory Coast.]—*Rev. Bot. appl.*, xv, 168, pp. 603–608, 1 pl., 1935.

The author states that further investigations have shown that the root rot caused by *Fomes lignosus* on coffee in the Ivory Coast is not restricted to the *Coffea liberica* and the indigenous Indenié variety [*R.A.M.*, xii, p. 91], but is also common on all the other varieties grown there. This crop is also attacked occasionally by *F. lamaensis* [*F. noxius*: ibid., xiv, p. 790], which, however, has not been so far observed to cause considerable damage. The use in coffee plantations of cover and shade plants such as *Albizzia lebbek*, *Leucaena glauca*, and *Tephrosia candida* is strongly deprecated, owing to their susceptibility to *F. lignosus*. This fungus was also recorded on *Hevea* rubber [ibid., xiv, p. 790], *Funtumia elastica*, *Styrax benzoin*, and *Oncoba echinata*. Cacao roots are severely rotted by *Armillariella* [*Armillaria*] *mellea* and *Lasiodiplodia* [*Botryodiplodia*] *theobromae* [ibid., xiii, p. 221; xiv, p. 87] as well as by *F. lignosus*. *Ganoderma applanatum* [ibid., xiv, p. 611] and *G. laccatum* were found causing root rots on the oil palm (*Elaeis* spp.) and *Citrus* trees, respectively, but do not appear to do much damage.

MAYNE (W. W.). **Annual Report of the Coffee Scientific Officer, 1934–1935.**—*Bull. Mysore Coffee Exp. Sta.* 13, 28 pp., 1 graph, 1935.

Further work on coffee leaf disease [*Hemileia vastatrix*] in southern India [*R.A.M.*, xiv, p. 164] indicated that resistance to strain I (to which a considerable proportion of Kent plants are resistant) is transmitted by a simple Mendelian dominant factor. Resistance to strain II has been found only in association with resistance to strain I, in plants probably of hybrid origin, and the mode of its inheritance remains obscure. The progeny by self-fertilization from one plant showing complete resistance in the field were either resistant to both strains (like the parent), resistant to strain I only (like typical Kent), or susceptible to both (like ordinary Coorg), while seedlings from another selfed resistant plant were either resistant like the parent or susceptible like Coorg.

In spraying trials against the disease sulphemulsol 2 per cent. [ibid.,

xii, p. 522] proved to be ineffective and also caused some burning of young foliage; this, in conjunction with the results previously obtained with sulphur-containing sprays, appears to indicate that sulphur is not a satisfactory fungicide against leaf disease.

Die-back shoots invariably showed the presence of *Colletotrichum coffeanum* [ibid., xiii, p. 367], which was frequently the only fungus isolated; it was always found in shoots showing the very earliest external symptoms of the disease. That it was also common on the surface of completely healthy shoots in a season when other shoots were dying back suggests that it is not a primary, active parasite, but that certain predisposing conditions are necessary before the shoots can become diseased. Laboratory inoculation with *C. coffeanum* gave inconclusive results, symptoms of die-back occurring in both the inoculated shoots and the controls. Field observations showed that the first signs of blackening always appear at a node, the subsequent symptoms developing so rapidly that a shoot which, apart from having lost some younger leaves, appears quite healthy is sometimes dead within a week. The evidence obtained supports the view that the primary predisposing factor in die-back is premature leaf fall due to *H. vastatrix*, though complete leaf fall is neither necessary to, nor inevitably followed by, die-back [loc. cit.]. It seems clear that die-back is not a simple parasitic disease, but one in which many factors are involved.

De Fluiter (H. J.). **De topsterfte in de Koffie.** [Top die-back in Coffee.] —*Alg. LandbWeekbl. Ned.-Ind.*, xx, 2, pp. 34–36, 1935.

This is a summary of a lecture on top die-back of coffee [*Rhizoctonia* sp.: *R.A.M.*, xiv, p. 743] delivered at a general meeting of the Besoeki (Java) Coffee and Rubber Circle at Djember on 29th June, 1935. The disease, first observed in Sumatra in 1926, is stated to be now widespread in Java, the Besoeki district, however, having been spared until recently, when a number of estates in the Yang mountains and one in the Kalibaroe region were found to be affected. The maximum temperature for the growth of the causal organism is 25° to 26° C., a fact that is considered to explain its virtual absence from plantations situated below 400 m. above sea level. *Coffea excelsa* is the most susceptible variety and *C. arabica* the least.

Top die-back is controllable to some extent in the seed-bed by prophylactic treatment with Bordeaux mixture, but the use of this method on a large scale is scarcely likely to prove feasible. Drastic pruning offers the greatest hope of successful elimination of the fungus. Care should be taken to burn the debris, in which the organism may persist for six weeks in a viable condition. The branches should be cut back at least as far as the first healthy pair.

By means of stringent precautions, including the careful examination of suspected grafting material for the presence of the disease, the retention of such material in the beds for some months to check the possible development of infection, and regular spraying, it is hoped to prevent the further spread of top die-back by grafting. Subject to these expedients, the export of grafting material is continued from the Kaliwining Experiment Station, which is still free from the disease, but nursery stock for this purpose will not be supplied from the infected

to the non-infected areas. The possibility of the transmission of the fungus by coffee seed is regarded as negligible [ibid., xi, p. 636] and no restrictions will be placed on its movement, though a precautionary disinfection may be desirable.

The paper was followed by a discussion on the pros and cons of these arrangements.

RADA (G. G.). **Principales enfermedades del Algodonero en el Perú.** [The principal Cotton diseases in Peru.]—*Circ. Estac. exp. agríc., Lima*, 28, 19 pp., 6 col. pl., 4 figs., 1935.

Notes are given in popular terms on the distribution, etiology, symptoms, control, and other features of the cotton diseases in Peru caused by *Fusarium vasinfectum* [*R.A.M.*, xiii, p. 231], *Rhizoctonia* [*Corticium solani*: ibid., xiv, p. 629], *Erysiphe malachrae* [ibid., xi, p. 511], *Helminthosporium gossypii*, and *Alternaria tenuis* [ibid., xi, p. 225]. In connexion with the mode of dissemination of *F. vasinfectum* it is stated that a maximum of 3 per cent. of the spores is seed-borne. Very promising results were given in the control of *C. solani* by seed disinfection with granosan [= American ceresan: ibid., xiii, p. 488] and ceresan at the rates of 130 and 400 gm. per quintal [50 kg.], respectively. The Peruvian Tangüis cotton appears to be less susceptible to *E. malachrae* than a number of standard varieties from the United States.

MORWOOD (R. B.). **Angular leaf spot of Cotton.**—*Qd agric. J.*, xliv, 1, pp. 15–17, 1935.

A brief, popular account is given of the symptoms, cause, and control of angular leaf spot of cotton (*Pseudomonas* [*Bacterium*] *malvacearum*) [*R.A.M.*, xiv, p. 757]. The disease is believed to have been present in Queensland for several years, but until recently was not regarded there as of serious importance. In 1935, however, it was suspected of causing marked deterioration to the crop, though heavy loss of yield has not yet occurred.

SAMPSON (A. E.). **Various applications of fluorescence analysis.**—*Amer. Dyest. Rep.*, xxiv, 1, pp. 8–10, 19–20, 1935.

Among the applications of fluorescence analysis in the textile industry is the detection, by means of the Cellaphane apparatus [the construction and use of which are concisely explained], of the various moulds liable to damage cotton [*R.A.M.*, xiv, p. 762] by their conspicuous violet tones. The instrument consists of a folding box equipped with a filter, e.g., of Wood's glass [ibid., xii, p. 23] which excludes visible light while allowing the passage of ultra-violet rays. Details are given of the two general methods of procedure employed in the work of analysis—visual and photometric.

DURNOVO (Z. P.). **Sickness in Agriotes obscurus L. and A. sputator L. caused by the fungus Entomophthora sphaerosperma Fres.**—*Zashch. Rast. Vredit., 1935*, 1, pp. 151–152, 2 figs., 1935. [Russian. Abs. in *Rev. appl. Ent.*, A, xxiii, 10, pp. 573–574, 1935.]

Early in June, 1928, 80 per cent. of the adults of *Agriotes obscurus* and *A. sputator* occurring in large numbers on the unploughed strips of soil between fields near Moscow were found to be attacked by *Entomo-*

phthora sphaerosperma [*R.A.M.*, xiii, p. 232], while those on green baits in fallow land showed only 10 per cent. infection. By mid-June the epidemic ceased in the field, but it continued until the end of the month in the insectary, where 30 per cent. of the beetles were destroyed. The development of the fungus is thought to have been favoured by the prolonged spell of cold, damp weather in the spring.

IYENGAR (M. O. T.). **Two new fungi of the genus Coelomomyces parasitic in larvae of Anopheles.**—*Parasitology*, xxvii, 3, pp. 440–449, 5 figs., 1935.

English diagnoses are given of two closely allied new species of *Coelomomyces* [*R.A.M.*, i, p. 70] found parasitizing various species of *Anopheles* larvae in India, namely, *C. indiana* and *C. anophelesica.* The mycelium of both species is unicellular, very thin-walled, piriform in the early stages, later tubular, forming short branches but not anastomosing, 7 to 14 μ or more in *C. indiana*, 7 to 12 μ in *C. anophelesica*, and attached to the fat-body of the host, apparently by very minute hyphae. In *C. indiana* the mature sporangium, measuring 38 to 60 by 25 to 36 μ, is typically oval, with a thick, opaque, yellow, sculptured wall. In *C. anophelesica* the corresponding dimensions are 34 to 44 by 28 to 40 μ, the shape in this case being asymmetrically circular and the wall provided with many raised ribs running in concentric or eccentric circles.

The development of both parasites is completed during the larval phase of the mosquito. Infection generally starts in the thoracic region and spreads along the adipose tissue into the abdominal segments. In the later stages of the disease the insects have practically no fat tissue, the place of which is taken by a thin membrane filled with dark brown pigment granules. Death usually occurs before pupation can take place.

OTERO (P. M.) & KOPPISCH (E.). **La aspergilosis en el Pollito. Estudio preliminar.** [Aspergillosis in Chicks. Preliminary study.]—*Eighth Reun. Soc. argent. Pat. reg. N.*, pp. 143–159, 14 figs., 1934. [Abs. in *Vet. Bull., Weybridge*, v, 11, pp. 702–703, 1935.]

Isolations from the lungs of young chicks in the Argentine affected by an epidemic of pulmonary aspergillosis showed the presence of *Aspergillus fumigatus* [*R.A.M.*, xiii, p. 371] and *Rhizopus microsporus* [ibid., ii, p. 464; iii, p. 157; vii, p. 28], artificial inoculations demonstrating that the former was the chief causative agent. The source of the infection was the crushed sugar-cane refuse of which the nests were made. Histologically, the condition was characterized by a granulomatous inflammation with the presence of pseudo-tubercles and mycelium in the lungs.

SARTORY (A.), SARTORY (R.), MEYER (J.), & MEYER (M.). **Contribution à l'étude des mycoses : le diagnostic des mycoses par les méthodes de laboratoire.** [A contribution to the study of mycoses: the diagnosis of mycoses by laboratory methods.]—*Ann. Inst. Pasteur*, lv, 2, pp. 182–207, 1935.

A comprehensive account is given of the laboratory procedure adopted

by the writers for the study and identification of the Actinomycetes and other lower fungi involved in the causation of human and animal diseases. On the receipt of material suspected to be of mycotic origin a division is made into five parts for the following purposes: (1) examination for sporotrichosis, blastomycosis, or any other condition accompanied by a mycelium with hyphae of relatively large diameter; (2) examination for actinomycosis; (3) anaerobic investigations; (4) direct examination in smears or drops; and (5) animal inoculations. For each of the foregoing objects four tubes of nutrient medium are prepared as follows: (*a*) Sabouraud's maltose liquid (P_H 6·8), (*b*) the same solid, (*c*) potato juice with glycerine and agar (P_H 6·6), and (*d*) the same adjusted to P_H 7·2. It is pointed out that the liquid medium is useful only for actinomycetic studies, solid substrata being preferable in all other cases. The culture tubes are incubated at 37° C. for 48 hours. The application of this technique to each of the above-mentioned investigational aspects is very fully described, especially as regards the Actinomycetes, the conclusion being reached that the lower fungi in general, and this group in particular, are highly exacting in their cultural requirements and need very specialized individual methods of study.

WEISZ (E.). **Über einige durch seltene Parasitenstämme verursachte Dermatomykosen.** [On some dermatomycoses caused by rare parasitic strains.]—*Derm. Z.*, lxxii, 1, pp. 1–10, 1935.

A concise summary is given of the literature on some rare forms of dermatomycosis [cf. *R.A.M.*, xiv, p. 694] due to *Aspergillus* spp., including *A. flavus*, *A. niger*, *A. terreus*, and *A. fumigatus*; *Penicillium glaucum*, *P. crustaceum*, and *P. minimum*; *Scopulariopsis* spp., including *S. brevicaulis* [ibid., xiv, p. 695] and *S. minimus*; *Cladosporium wernecki* [ibid., x, p. 666]; *Acremonium muthuoni*, *A. cordae*, *A. potroni* [ibid., xiii, p. 701], *Acremoniella berti*, and related species; *Scedosporium apiospermum* [ibid., xiii, pp. 512, 637]; *Hemispora stellata* [ibid., xiv, p. 169]; *Acladium castellanii* [ibid., xiv, p. 308]; *Trichosporum beigeli* [ibid., xii, p. 172]; and *Glenospora clapieri-catanei*.

REED (A. C.) & JOHNSTONE (H. G.). **A clinical study of intestinal fungi.**—*Amer. J. trop. Med.*, xv, 2, pp. 155–174, 1935.

No evidence could be found of any etiological association between a number of intestinal fungi including *Monilia* [*Candida*] *albicans*, *M. candida* [*C. vulgaris*], *M.* [*C.*] *krusei* [*R.A.M.*, xiv, p. 444], *Torula* sp., *Endomyces* sp., and an organism allied to *Oidium* [*Oospora*] *lactis*, isolated from fifty patients in California, and the disorders from which these persons were suffering [cf. ibid., xiii, p. 163].

KESSEL (J. F.) & HOLTZWART (F.). **Experimental studies with Torula from a knee infection in man.**—*Amer. J. trop. Med.*, xv, 4, pp. 467–478, 3 pl., 1935.

An account, dealing primarily with the clinical and experimental aspects of the case, is given of a granulomatous lesion of the knee in a 38-year-old Mexican in California caused by *Torula histolytica* [*Torulopsis neoformans*: *R.A.M.*, xiv, pp. 444, 758]. The results of

the inoculation tests on laboratory animals are stated to have raised certain questions with reference both to tissue selectivity of different strains of *Torula* and to spontaneous recovery from infection by the fungus.

BAEZA (M.). **Notes upon non-chromogenous anascospored yeasts and the value of fermentation reactions in order to establish their botanical position.**—*J. trop. Med.* (*Hyg.*), xxxviii, 13, pp. 161–163, 1935.

Further tests in London and Madrid on the fermentation reactions [which are tabulated] of a number of non-chromogenous, anascosporous yeasts [*R.A.M.*, xiv, p. 192] confirmed the results obtained in previous experiments and again demonstrated the value of these responses as taxonomic criteria [ibid., xiii, pp. 636, 767].

RADAELI (F.). **Sopra un caso di onicomicosi da Cryptococcus interdigitalis Pollacci e Nannizzi.** [On a case of onychomycosis caused by *Cryptococcus interdigitalis* Pollacci & Nannizzi.]—*Boll. Sez. reg.* (*Suppl. G. ital. Derm. Sif.*), xiii, 2, pp. 171–172, 1935.

The fungus isolated from the nails of a young woman suffering from onychomycosis was identified by Prof. Pollacci as *Cryptococcus interdigitalis* Poll. & Nann. It was characterized in culture by white or whitish-yellow, pasty, smooth, glistening colonies composed chiefly of globose or oval elements, sometimes budding, with an average diameter of 4 to 5 μ, besides some large hyphae of a rudimentary mycelium. An unusual feature of the case was the brown, brownish-green, or green tinge imparted to portions of the affected nails by the fungus.

ILDRIM (D. J.). **Madurapilz im Nordkaukasus (U.S.S.R.).** [The Madura fungus in the North Caucasus (U.S.S.R.).]—*Arch. Schiffs- u. Tropenhyg.*, xxxix, 8, pp. 348–349, 1935.

The fungus isolated at the Baku Tropical Institute from plantar abscesses on the foot of a female patient from the North Caucasus, and cultured on agar-glycerine (the only suitable medium among those tested) at 18° to 26° C., was characterized by hyphae of variable diameter, frequently septate, yellowish to blackish-brown with a green tinge, and mostly ending in clavate or more rarely fusiform swellings from which one to six spores were extruded. Intercalary chlamydospores were present and *Acladium*-like elements were occasionlly observed. This is believed to be the first record of 'Madura foot' [*R.A.M.*, xi, p. 242] in Soviet Russia.

MILIAN & KARACHENTZEFF. **Epidémie de trichophytie propagée par un chat. Epidémie trichophytique à 'Microsporum felineum'.** [An epidemic of trichophytosis spread by a cat. A trichophytic epidemic due to *Microsporum felineum*.]—*Bull. Soc. franç. Derm. Syph.*, *1935*, 6, pp. 944–945; 7, p. 1357, 1935.

Microsporon felineum [*R.A.M.*, xiv, p. 581] was identified as the agent of a virulent ringworm originating in a cat and thence communicated in rapid succession to three persons.

JACOBS (W. A.) & CRAIG (L. C.). **On an alkaloid from ergot.**—*Science*, N.S., lxxxii, 2114, pp. 16–17, 1935.

The authors record the isolation of an alkaloid from ergot [*Claviceps purpurea*: see next abstracts] identical with the ergobasine of Stoll and Burckhardt (*C.R. Acad. Sci., Paris*, cc., p. 1680, 1935) and possibly the same as that described by Dudley and Moir (ergometrin) and Kharasch and Legault (ergotocin) [*R.A.M.*, xiv, p. 697], though the question of identity is left open for the present. Chemical evidence is submitted that the substance is hydroxyisopropylamide of lysergic acid.

DALE (H. H.). **The new ergot alkaloid.**—*Science*, N.S., lxxxii, 2118, pp. 99–101, 1935.

Reviewing the position with regard to the identity and nomenclature of the new ergot [*Claviceps purpurea*] alkaloid, the writer urges the prompt acceptance and standardization by all concerned of the name ergometrine (Dudley and Moir, 1932), with which it appears almost certain that ergotocin, ergobasine, and ergostetrine are identical [see preceding and next abstracts].

RÖSSLER (R.) & UNNA (K.). **Zur Pharmakologie des neuen Mutterkornalkaloides Sensibamin.** [On the pharmacology of the new ergot alkaloid, sensibamin.]—*Arch. exp. Path. Pharmak.*, clxxix, 1, pp. 115–126, 8 graphs, 1935.

The results of pharmacological tests at the University of Vienna showed that the new rye ergot [*Claviceps purpurea*] alkaloid, sensibamin (Chinoin A.-G. & Wolf, Ujpest, Hungary) [*R.A.M.*, xiv, p. 511 and preceding abstracts] possesses all the specific properties of the recognized alkaloids from the same source, and does not differ appreciably from them in toxicity and efficacy.

MAMELI CALVINO (Mme E.). **Malattie delle Rose prodotte da Coniothyrium.** [Rose diseases caused by *Coniothyrium*.]—*Costa azzur. agric.-flor.*, xv, 193, pp. 121–125, 2 figs., [? 1935. Abs. in *Riv. Pat. veg.*, xxv, 7–8, pp. 326–327, 1935.]

A short description is given of *Coniothyrium wernsdorffiae* [*R.A.M.*, xiii, p. 703], *C. rosarum*, and *C. fuckelii* [*Leptosphaeria coniothyrium*: ibid., xiv, p. 313] on rose trees near San Remo. The variety U. Brunner under glass at Col di Rodi showed the presence of *C. rosarum* on dried-up stumps left after pruning. The fungi are regarded as wound parasites, spread probably by insects. The paper concludes with brief directions for control by the disinfection of pruning wounds, spraying with Bordeaux mixture, improved ventilation in the glass-houses, and soil treatments.

MEHLISCH (K.). **Der Rosenrost und seine Bekämpfung.** [Rose rust and its control.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 33, pp. 402–403, 1935.

A popular note is given on the symptoms and life-history of rose rust (*Phragmidium subcorticium*) [*P. mucronatum*: *R.A.M.*, xiv, p. 313],

and on its control by spraying with 1 per cent. Bordeaux mixture and appropriate cultural measures, including regular liming and the application to the soil of 'patent-kali' (potassium sulphate-magnesia). Susceptibility to the disease has been found to vary somewhat in different seasons in the Friesdorf [near Bonn] district of Germany. During the past year the *Rosa rubiginosa* hybrids Amy Robsart, Brenda, and Meg Merrilees, as well as *R. rugosa* K. Meyer were severely attacked, while in former years *R. canina*, *R. laxa*, and on one occasion the tea hybrid John Russell suffered extensive damage. On the whole, however, tea hybrids, ramblers, and the Polyantha types are well able to withstand infection by *P. mucronatum*, Kirsten Poulsen being the only one among 20 of the last-named group to show very mild symptoms.

ROSEN (H. R.). **Rose blast induced by Phytomonas syringae.**—*J. agric. Res.*, li, 3, pp. 235–243, 6 figs., 1935.

A brief account is given of a diseased condition of the Magna Carta (hybrid perpetual) rose which was observed in the spring of 1933 at Fayetteville, Arkansas, characterized by the development on the receptacles, calyx lobes, flower stalks, and more rarely on the leaf petioles, of blackish-brown, necrotic lesions, varying in size and shape from oval or rounded spots not over 1 mm. in diameter to narrow streaks, 5 to 8 cm. in length. The individual spots and streaks were sunken, especially on the pedicels and receptacles, and often surrounded by a narrow red border. Most of the affected flower buds failed to open. Isolations from diseased tissues yielded an organism which was shown to be pathogenic to pear (Bartlett) and lilac, and to produce black pit lesions on lemons, typical of *Phytomonas* [*Pseudomonas*] *syringae* [*R.A.M.*, xiv, pp. 16, 319, 707], with which it is identified. Attempts to inoculate the pink Radiance rose with the organism gave negative results, and other rose varieties growing close to the diseased Magna Carta plants remained free from the trouble.

MEHLISCH (K.). **Eine Blattfleckenkrankheit der Dahlie.** [A leaf disease of the Dahlia.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 32, pp. 390–391, 1935.

A considerable extension of the greyish-brown spotting and premature shedding of dahlia leaves due to *Entyloma dahliae* [*R.A.M.*, vi, p. 97; xiii, p. 655 *et passim*] is stated to have been recently observed in the Friesdorf [near Bonn] district of Germany. The chlorotic aspect of the foliage is sometimes accompanied by curling. The use of a 1 per cent. Bordeaux mixture is indicated. Similar symptoms are produced on *Calendula officinalis* by *E. calendulae* [ibid., xiv, p. 654], on poppy (*Papaver somniferum*) by *E. fuscum*, and on *Borago officinalis* by *E. serotinum* [ibid., iv, p. 191].

RIKER (REGINA S.) & JONES (L. R.). **Fusarium strains in relation to wilt of China Aster.**—*Phytopathology*, xxv, 8, pp. 733–747, 1 pl., 1 fig., 1935.

In further studies on the wilt of China aster (*Callistephus chinensis*) caused by *Fusarium*, a preliminary note on which has already appeared

[*R.A.M.*, xii, p. 448], the authors found that ten forms of the section *Elegans*, capable of inducing wilt in other plants, failed to infect China aster. Tests of 27 strains from wilting asters showed some, but not all, to be pathogenic, and with the exception of *F. lateritium* var. *fructigenum* [ibid., xiv, p. 40] the pathogenic forms belonged to the *Elegans* section, though all the species belonging to this section could not infect asters. Varieties of the same species sometimes differed in their ability to induce wilt.

The writers conclude that the morphological and cultural characters of the species associated with aster wilt are not a reliable index of pathogenicity, and that substantially the same type of disturbance may follow infection by strains classified as belonging to different varieties, species, or even sections of *Fusarium*.

BALFE (ILMA G.). **An account of sclerote-forming fungi causing diseases in Matthiola, Primula, and Delphinium in Victoria.**—*Proc. roy. Soc. Vict.*, xlvii (N.S.), 2, pp. 369–386, 5 figs., 4 graphs, 1935.

In 1932 and 1933 a troublesome damping-off of *Matthiola incana* seedlings occurred at the Footscray Gardens, Victoria. From the diseased material *Rhizoctonia solani* (*Corticium vagum* var. *solani*) [*C. solani*] was repeatedly isolated and its pathogenicity established by inoculation experiments and retroculture. Comparative cultural studies were made on the strain of *C. solani* isolated from *M. incana* and three other cultures of the fungus, one from cereals in South Australia [*R.A.M.*, xii, p. 159], and two of Kühn's from the Centraalbureau voor Schimmelcultures, Baarn, Holland, originating, respectively, on potato and turnip [ibid., iv, p. 443]. On malt agar the optimum temperature for the growth of the *M. incana* and turnip strains was about 19° C., the corresponding figure for those from cereals and potato being between 26° and 28° [ibid., xii, p. 187]; at 30·5° to 32° the development of the turnip strain practically ceased.

Sclerotinia minor [ibid., xiii, 241] was isolated from the collar of diseased *Primula malacoides* growing in the Footscray Gardens. In culture on malt and oatmeal agars saltation was observed to occur, some of the sclerotia forming mycelium with sclerotia and others developing only microconidia. Transfers through successive generations from these microconidial cultures have as yet yielded no sclerotium-producing colonies. Two sclerotia of the fungus germinated after one hour's exposure to ether vapour during periods of very hot weather, but the apothecia did not mature.

Delphinium plants at Essendon, Victoria, were attacked by a fungus causing foliar yellowing and wilting, followed by desiccation and death due to the decay of the root and collar regions, which were encircled by a white mycelium with small, brown sclerotia. In pure culture on malt agar a fan-like growth of densely flocculent mycelium is produced and sclerotia of uniform size, subglobose, white at first, darkening to clove-brown, often exuding droplets of amber-coloured liquid. From a comparison of the fungus with *Sclerotium delphinii* [ibid., xiv, p. 147] and *C. centrifugum* [ibid., xiv, pp. 385, 701] (Wolf's strain of *S. rolfsii*) [ibid., xi, p. 748] the author considers, on the basis of vegetative characters alone, that it should be referred to *C. centrifugum*.

Crooks (Kathleen M.). **A powdery mildew of Boronia megastigma Nees.**—*Proc. roy. Soc. Vict.*, xlvii (N.S.), 2 pp. 365–366, 1 pl., 1935.

Boronia megastigma was attacked in Victoria in 1933 by an apparently new species of *Oidium* to which the name of *O. boroniae* is given with English and Latin diagnoses. The fungus is characterized by a dense, white mycelium with predominantly unbranched fertile hyphae, 6·5 to 9 μ in diameter, and ovoid conidia measuring 19 to 28 by 11 to 18 μ (average 28 by 13 μ). The mildew affected exclusively the petals of the flowers, the normally black outer surface of which was covered with a white mycelial felt and presented a dry, wrinkled aspect.

Fisher (Eileen E.). **'Sooty mould' of the tree-fern Dicksonia.**—*Proc. roy. Soc. Vict.*, xlvii (N.S.), 2, pp. 387–388, 1935.

The fronds of a *Dicksonia* in a fernery near Melbourne were found to be covered by a dense, black film, apparently formed exclusively by the fungus *Teichospora salicina*, one of the constituents of a sooty mould of *Bursaria spinosa* in Victoria [*R.A.M.*, xiii, p. 187]. The ascospores of the *Dicksonia* fungus measure 19·5 by 9·5 μ, these dimensions being slightly larger than those recorded for *T. salicina* on *B. spinosa*, but the pycnidial stages are identical in both cases (16·5 by 8·2 μ) apart from the occasional presence of a fringe round the ostiole in the *Dicksonia* strain.

Pape (H.). **Eine häufige Blattfleckenkrankheit an Phlox.** [A common leaf spot disease of *Phlox*.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 35, pp. 426–427, 2 figs., 1935.

A popular note is given on the prevalent leaf spot of *Phlox paniculata*, *P. drummondii*, *P. virginica*, and *P. repens* [? *P. reptans*] in Germany caused by *Septoria phlogis* [*R.A.M.*, vi, p. 336]. The dark reddish-brown, white-centred, almost circular lesions are scattered over the leaf blades, especially on the lower, older foliage, which dies prematurely and shrivels. Diseased plants are stunted and generally flower scantily. The black, spherical pycnidia of the fungus, 100 to 200 μ in diameter, developing in the centre of the spots, contain curved, one- to five-celled, hyaline spores, 40 to 60 by 1 to 2 μ. In a North German nursery-garden in 1934 the U. Deutschland variety was very severely attacked and Mia Ruys practically free from infection, while a number of others showed intermediate reactions. Württembergia and other white varieties were heavily infected in a Central German establishment, where Hauptmann Köhl was immune. Control measures are briefly indicated.

Sommer (H.). **Ist die Welkekrankheit durch Saatgut übertragbar?** [Is the wilt disease transmissible by the seed?]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 34, pp. 413–414, 1935.

The writer carried out an experiment at Darmstadt, the results of which showed conclusively that wilt disease (*Verticillium albo-atrum*) of *Antirrhinum* [*majus*: cf. *R.A.M.*, iv, p. 495; xii, p. 470] is not seed-borne. Infection developed, on the other hand, to the extent of 18 per cent. among plants from healthy seed in soil that had previously borne

neither *Antirrhinum* nor asters [*Callistephus chinensis*: cf. ibid., xiv, p. 447]. The Rubin variety proved to be considerably more susceptible than Schneeflocke (26 as compared with 12·5 per cent. infected).

WHITE (R. P.). **Pestalotia spp. on Aucuba, Cibotium, and Leucothoë.**—*Mycologia*, xxvii, 4, pp. 342–346, 1 pl., 1935.

The author gives brief notes on, and Latin and English diagnoses of, three undescribed species of *Pestalotia* [*Pestalozzia*] from New Jersey, namely, *P. cibotii*, shown to cause the destruction of *Cibotium schiedei* fronds under greenhouse conditions [*R.A.M.*, xiv, p. 152], *P. aucubae*, a weak wound parasite on *Aucuba japonica* var. *variegata* and usually occurring on sun-scalded areas of the host, or following the large black leaf spots caused by *Colletotrichum pollaccii* [cf. ibid., vi, p. 175]; and *P. leucothoës*, a secondary parasite on leaves of *Leucothoë catesbaei* following other fungi or winter injury.

MICHAELIS (F.). **Erhöhte Wachstumsintensität und Pilzresistenz durch Plasmavererbung, sowie über die Bedeutung des Plasmas bei Kreuzungsschwierigkeiten.** [Enhanced intensity of growth and fungal resistance through cytoplasmic inheritance, together with a note on the significance of the cytoplasm in hybridization difficulties.]—*Züchter*, vii, 3, pp. 74–77, 2 figs., 1935.

In connexion with his studies at the Kaiser Wilhelm Genetic Institute, Müncheberg, Mark Brandenburg, on the cytoplasmic inheritance of vigorous growth and resistance to mildew (*Erysiphe* sp.) in the F_{11} progeny of back-crosses between *Epilobium hirsutum* and *E. luteum* [*R.A.M.*, xiv, p. 464], the writer points out that no definite conclusion can yet be reached as to the part played by the mother cell in the process. It seems probable, however, that the female cytoplasm merely serves to stimulate or depress the reactions of the male nuclear genes, and that it contains no actual bearers of hereditary characters comparable to the male genes. It is impossible at this stage of the investigations definitely to assert that the combination of *E. luteum* cytoplasm with *E. hirsutum* nuclear genes results in a blend of maternal and paternal characters, although the enhanced resistance to mildew, the branching habit of growth, and the broad leaves are typical of the female parent. The sole fact emerging from the experiments is that an hereditarily fixed cytoplasm influences the form assumed by the external characters.

A brief discussion is given on the possibilities of a general application of the principles involved in this particular instance, and also on the relation of the cytoplasm to compatibility between *Epilobium* parents in hybridization experiments.

KUPREWICZ (V. F.). К биологии **Polythrincium trifolii Kunze (Dothidella trifolii Bayl.-Elliott et Stansf.).** [Note on the biology of *Polythrincium trifolii* Kunze (*Dothidella trifolii* Bayl.-Elliott & Stansf.).]—*Acta Inst. bot. Acad. Sci. URSS*, Ser. II (*Plantae Cryptogamae*) *1935*, 2, pp. 369–375, 1 fig., 1935. [German summary.]

The author states that cross-inoculation experiments in 1933, carried out both in pots and in field plots, showed the existence in the region

of Leningrad of two specialized forms of black blotch (*Dothidella trifolii*) [*R.A.M.*, xiv, p. 367] of clovers, inasmuch as ascospores collected on *Trifolium repens* were only able to infect their own host and to a somewhat lesser extent also *T. hybridum*, while ascospores from *T. medium* failed to infect both *T. repens* and *T. hybridum*, except in the greenhouse where a few plants of the last-named species proved susceptible, presumably owing to the exceptionally favourable environmental conditions. Attempts to infect *T. pratense* with ascospores of both forms gave negative results, and careful search in the region failed to reveal naturally infected plants of this species in the field. Inoculations with the spores of the conidial stage (*Polythrincium trifolii*) [loc. cit.] of the fungus invariably gave negative results.

Apart from the difference in pathogenicity, the two forms (for which the names ff. spp. *repentis* and *medii*, respectively, are suggested) also differ in the size and shape of their asci and ascospores, which measure 80 to 98 by 29 to 35 μ and 23 to 31 by 5 to 6 μ, respectively, in f. sp. *repentis*, as against 72 to 90 by 30 to 36 μ and 28 to 35 by 5 to 6·9 μ in f. sp. *medii*.

Rodigin (M. N.). Некоторые замечания о паразитном грибке **Plenodomus meliloti Mark.-Let.** [Some notes on the parasitic fungus *Plenodomus meliloti* Mark.-Let.]—*Acta Inst. bot. Acad. Sci. URSS*, Ser. II (*Plantae Cryptogamae*) *1935*, 2, pp. 353–354, 1935.

A serious collar rot of sweet clover (*Melilotus alba*) and a somewhat less injurious stem spot of lucerne were found in 1933 in the neighbourhood of Ulyansk, U.S.S.R., to be caused by a fungus which on isolation proved to agree closely with Mme Markova-Letova's description of *Plenodomus meliloti* on sweet clover from the Leningrad region (*Morbi Plantarum*, Leningrad, xvi, 3–4, p. 195, 1927), and is considered to be identical with it. A comparison of Markova-Letova's diagnosis with that of *P. meliloti* published by Dearness and Sanford from Canada in 1930 [*R.A.M.*, x, p. 110] leads the author to believe that both probably deal with the same fungus, in which case priority belongs to Markova-Letova's name.

Davis (W. H.). **Summary of investigations with Ustilago striaeformis parasitizing some common grasses.**—*Phytopathology*, xxv, 8, pp. 810–817, 1935.

Much of the information contained in this summary of the author's studies, covering a twelve-year period in Iowa, Wisconsin, Illinois, New York, Pennsylvania, and each of the New England States, on the leaf smut of grasses caused by *Ustilago striaeformis* has already been noticed [*R.A.M.*, ix, p. 390].

Additional evidence is here presented of physiologic specialization in the forms of the smut occurring on *Phleum pratense*, *Agrostis alba*, *Dactylis glomerata*, *Poa pratensis*, and *P. annua*, that on *D. glomerata* being raised to specific rank as *U. clintoniana* n.sp. on account of its larger, more regular, smoky brown, echinulate spores (12 by 10 μ), aggregated in globose to elongated masses between the leaf traces in the leaf blades, sheaths, and stems, and germinating with long germ-tubes; the species is only known to occur in these localities in New

York State and is stated to be 'biologically fixed' to its host. *U. salveii*, reported by Liro in his study on the Finnish Ustilagineae as confined to *D. glomerata* in Europe (*Ann. Acad. Sci. Fenn.*, A, xvii, p. 1, 1924) has considerably narrower spores (12 by 8 μ). For the American physiologic forms of *U. striaeformis* the following classification is proposed: f. *phlei* on *Phleum pratense*, f. *agrostidis* on *A. palustris*, f. *poae-pratensis* on *Poa pratensis*, and f. *poae-annuae* on *P. annua*, or, if Liro's system of classification be adopted, these forms would become *U. phlei-pratensis*, *U. agrostis-palustris*, *U. poae-pratensis*, *U. poae-annuae* spp. nov.

CHAMBERLAIN (E. E.). **Sore-shin of blue Lupins. Its identity with Pea mosaic.**—*N.Z. J. Agric.*, li, 2, pp. 86–92, 4 figs., 1935.

After referring to the close similarity between the sore shin disease of blue lupins (*Lupinus angustifolius*) in New Zealand and the lupin disease reported by Richter from Germany [*R.A.M.*, xiv, pp. 108, 109] the author describes experiments [the results of which are tabulated] in which six garden pea plants out of 24 inoculated with juice from affected blue lupins developed typical symptoms of pea mosaic, while all the 24 control plants remained healthy. Of 20 sweet pea plants inoculated with the juice from the infected garden peas two developed typical mosaic symptoms. Of nine lupins inoculated with the juice from one of the mosaic garden peas two developed typical sore shin symptoms.

Experimental evidence indicated that sore shin is not readily transmitted by *Thrips tabaci*. Aphids were not observed naturally infesting blue lupins, but sore shin was readily transmitted to this host from broad beans naturally infected with mosaic by *Aphis rumicis* and from mosaic-infected garden peas by *Myzus persicae*. Sore shin, pea mosaic, and broad bean mosaic are due, therefore, to the same virus which also affects sweet peas, red clover [*Trifolium pratense*], and various other clovers in New Zealand.

No evidence was obtained that the sore shin disease is seed-borne, and the virus is thought to overwinter in some other host, field observations indicating that red clover is implicated.

Stationary spraying plants.—*Fruit World, Melbourne*, p. 26, 1935.

After stating that over 70 stationary spraying plants, almost all of them of the return overhead type, are now in operation in Tasmania [*R.A.M.*, xiii, p. 529], the author points out a number of advantages that attaches to their use. The grower is independent of weather conditions in applying the different sprays, the difficulties encountered in transporting a heavy spray vat and engine over sodden ground are eliminated, there are no journeys to and from the water supply and no emptying and re-filling of vats, and steep banks and slopes are more easily negotiated [ibid., xiii, pp. 171, 218].

HOLZ (W.). **Eine Methode zur Feststellung des Befalls mit Fusicladium dendriticum vor dem Ausbruch der Schorfkrankheit bei Pirus malus.** [A method for the detection of attack by *Fusicladium dendriticum* before the outbreak of scab disease in *Pyrus malus*.]—*Zbl. Bakt.*, Abt. 2, xcii, 20–23, pp. 459–461, 2 figs., 1935.

The writer describes a method of detecting the presence of *Fusi-*

cladium dendriticum [*Venturia inaequalis*] in apple leaves during the incubation period of the fungus. The green leaves are boiled to transparency in 20 per cent. potash lye, whereby they shrink to a fifth of their original size and may be conveniently examined on slides after 5 to 10 minutes in 96 per cent. acetic acid, which should be rinsed off with running water. The slide should be slightly warmed before placing on the leaf a few drops of a 0·5 per cent. gentian violet solution, followed by a similar quantity of a very dilute cotton blue solution, all superfluous stains being immediately removed. Under the joint action of these two solutions the leaf veins are stained sky-blue and the mycelium reddish-purple.

NATH (P.). **Studies in the diseases of Apples in northern India. II. A short note on Apple scab due to Fusicladium dendriticum Fuckel.**—*J. Indian bot. Soc.*, xiv, 2, pp. 121–124, 1935.

Apple scab (*Venturia inaequalis*) is stated to be prevalent in Kashmir, and at Lahore in the conidial stage (*Fusicladium dendriticum*). The morphology of the fungus and its effects on the leaves and fruits are briefly described; affected leaves are said to fall readily. Conidia kept in a refrigerator at 3° C. for nearly three months failed to germinate; in the case of fresh material germination took place in 10 to 12 hours at 10° to 12° but did not occur at all at 30°. The rapid loss of germinative capacity by the conidia explains the inability of these organs to produce fresh infections in the following season [cf. *R.A.M.*, xiv, pp. 589, 590]. Only fresh spores, at low temperatures, are able to germinate.

RUDLOFF (C. F.) & SCHMIDT (M.). **Der Erreger des Apfelschorfes, Venturia inaequalis (Cooke) Aderh. Grundlagen und Möglichkeiten für seine Bekämpfung auf züchterischem Wege. II.** [The agent of Apple scab, *Venturia inaequalis* (Cooke) Aderh. Foundations and possibilities of its control by means of breeding. II.]—*Züchter*, vii, 3, pp. 65–74, 2 figs., 1935.

After summarizing the available information on the biology of the causal organism of apple scab (*Venturia inaequalis*) [see preceding and next abstracts], the reaction of different varieties of *Malus* [*Pyrus*] to the fungus, and the influence of environmental conditions on the parasitic relationships of the latter, the writers outline their plan of campaign for the development of resistant types of apple by means of breeding.

None of the cultivated varieties of apple appears to possess absolute resistance to scab irrespective of climatic conditions and local factors, but among the wild relatives of the fruit are a number of more or less resistant forms. The work of breeding must be commenced by a thorough investigation of the reaction to scab of the standard apple varieties in as many fruit-growing districts as possible with a view to their accurate grading from this standpoint, while at the same time the susceptibility of the wild forms should be tested by artificial inoculation. Among the latter will be some suitable for crossing with a superior commercial variety, and marked segregation of morphological characters being a feature of the F_1 progeny of such crosses, the production of a great variety of resistant types is to be anticipated.

The testing of the breeding material for scab resistance by mass inoculation is recommended, followed by tests of a more exacting nature and eventually by field trials. The morphological and physiological characteristics of the biologic forms of the fungus, the factors determining resistance, and other problems also require investigation in connexion with the work.

RUDLOFF (C. F.). **Venturia inaequalis (Cooke) Aderhold. III. Zur Formenmannigfaltigkeit des Pilzes.** [*Venturia inaequalis* (Cooke) Aderhold. III. On the pleomorphism of the fungi.]—*Gartenbauwiss.*, ix, 2, pp. 105–119, 14 figs., 1935.

Monoconidial cultures of *Venturia inaequalis* [*R.A.M.*, xiv, p. 241 and preceding and next abstracts] were isolated from a large number of apple varieties in different parts of Germany and at Wädenswil, Switzerland, and grown under uniform conditions on solid (agar) and liquid media. A striking degree of pleomorphism was shown by the various isolations, involving the type, topography, and rate of growth, the colour and structure of the mycelium, hyphal shape, and conidial production. Particularly striking from a morphological standpoint was the culture from Zuccalmaglio Pippin leaves in comparison with a Beauty of Boskoop strain, which may be taken as representing the 'normal' development of the fungus. Among the differences between these two strains, which were less apparent in pear juice and disappeared entirely on pear juice agar, were the following. On solid media Zuccalmaglio is characterized by profuse branching and forms no conidia, in contrast to Boskoop, which except on pear juice agar produces these organs in abundance. The Zuccalmaglio strain grows in a vertical direction except on pear juice agar, whereas Boskoop invariably develops horizontally. These results show that each of these strains reacts specifically to the different media. The Zuccalmaglio strain showed a pronounced tendency to spontaneous vegetative mutation. The examination of four mutants revealed the constancy of their typical cultural characters. One mutant produced a secondary variant, from which yet another arose. The aberrant types developed either by sectoring in an agar culture or in the process of subculturing. The occurrence of these and other mutations not enlarged upon here clearly demonstrates the unstable character of the Zuccalmaglio strain, a tendency that was subsequently found to be shared by that obtained from the Gratz' Liebling variety.

SCHMIDT (M.). **Venturia inaequalis (Cooke) Aderhold. IV. Weitere Beiträge zur Rassenfrage beim Erreger des Apfelschorfes.** [*Venturia inaequalis* (Cooke) Aderhold. IV. Further contributions to the strain problem in the agent of Apple scab.]—*Gartenbauwiss.*, ix, 5, pp. 364–389, 6 figs., 1 graph, 1935.

In further studies at the Kaiser Wilhelm Plant Breeding Institute, Müncheberg, Mark Brandenburg, on physiologic specialization in the apple scab fungus (*Venturia inaequalis*) [see preceding abstract], special attention was paid to the conidial characters of monospore cultures isolated from different hosts. Marked variations were observed not only in the abundance of conidial production but in the size and

shape of these organs developing in cultures from different hosts on the same medium (yeast extract plus 1 per cent. cane sugar) maintained at uniform temperatures. Thus, at the end of 33 days no conidia were produced by the cultures from the local varieties Winter Golden Pearmain and Muscat Reinette, whereas they were formed in profusion by the strains from Berne Rose, Adersleber Calvill, and Geheimrat Dr. Oldenburg, those from other varieties being intermediate in this respect. The shortest conidia in 24-day-old cultures, with a mean length of 20·31 μ, were those of the Geheimrat Dr. Oldenburg strain, while the longest (27·30 μ) were produced by the Antonowka. The mean breadth of the Antonowka conidia in 33-day-old cultures was $8{\cdot}67 \pm 0{\cdot}154\ \mu$ compared with $9{\cdot}08 \pm 0{\cdot}069$ and $10{\cdot}01 \pm 0{\cdot}107\ \mu$, respectively, for Ernst Bosch and Berne Rose.

Inoculation experiments with monospore isolations of *V. inaequalis* from various sources showed that all were capable of infecting not only the variety on which they originated, but also other varieties and species of *Malus* [*Pyrus*]. Re-isolated on an agar medium, all the cultures presented their original characters, irrespective of the intermediate host, indicating that the latter exercises no influence on the morphological features of the fungus in culture.

From 18 to 20 leaves of one tree each of Beauty of Boskoop, Cox's Orange Pippin, and *P. baccata*, 100 monospore cultures were isolated on nutrient agar and compared at identical ages. Beauty of Boskoop yielded 35, Cox's Orange 53, and *P. baccata* 23 distinct morphological types of the fungus, presumably representing hereditary strains and mixtures thereof, though definite proof of this assumption can only be obtained by the hybridization experiments which have already been initiated. It can definitely be stated, however, as a result of these investigations, that there is no direct correlation between morphological individuality in *V. inaequalis* and physiologic specialization on a particular host.

Van Zinderen Bakker (E. M.). **Investigations about the morphology and physiology of Physalospora cydoniae Arnaud.**—*Thesis*, Phytopathologisch Laboratorium 'Willie Commelin Scholten', Baarn, xv+114 pp., 8 pl., 10 graphs [1935]. [Dutch summary.]

In this elaborate study of the strain of *Physalospora cydoniae* (*P. obtusa*) [*R.A.M.*, xiv, p. 777] isolated by Miss Buisman from *Ulmus americana* in New England in 1929 [ibid., xi, p. 212], the author first summarizes in some detail the work which has been done on the nomenclature of the fungus, and considers that if type material of Peck's *Sphaeropsis malorum* agrees with Westendorp's *Haplosporella mali* (West.) Pet. & Syd. the latter name must be adopted for Peck's fungus and the name *Botryodiplodia malorum* (Berk.) Pet. & Syd. for *S. malorum* Berk. After discussing its geographical distribution, economic importance, and symptomatology the author states that in Holland the fungus has only been recorded twice and has not so far caused any serious damage.

In a series of experiments on malt salep agar the strongest growth occurred at 25° C. In modified Richards's solution the P_H optimum appeared to lie at 6, with possibly a second optimum at 4·4. A comparison

of the effect on growth of different sources of carbon showed that soluble starch gave the best growth, followed by dextrin, maltose, saccharose, glucose, fructose, and arabinose; even smaller growth took place with galactose or peptone, and the least with gum arabic, gelatine, and lactose; cellulose also was utilized by the fungus. With saccharose as a carbon source the optimum and maximum concentrations were, respectively, 27·3 and about 50 per cent. The best source of nitrogen for the fungus was peptone; asparagin was good and urea very bad. Nitrate nitrogen was very slightly preferred to ammonium nitrogen, but in strongly buffered solutions potassium nitrate and ammonium chloride, sulphate, and nitrate proved to be practically equal. In slightly buffered solutions with ammonium chloride as the nitrogen source strong acidification took place, the different P_H values of all the solutions finally reaching 3, while in similar solutions with potassium nitrate the final reading was P_H 4·8. The optimum and maximum concentrations of potassium nitrate were, respectively, between 1 and 3·4 and not over 6·8 per cent.

The optimum phosphate (potassium phosphate) concentration for growth was 0·27 per cent. but concentrations of 2·7 to 0·03 per cent. all gave good results. With lower concentrations the effect on growth was difficult to determine owing to the marked changes in P_H value. No growth occurred in concentrations of 13·7 per cent.

The optimum sulphur and magnesium concentration was almost reached in the solution containing 0·25 per cent. crystalline magnesium sulphate, though good growth occurred at 1 per cent. Growth was good without sulphur, but very poor without magnesium. The effect of the varying nutrient solutions was manifest in the modifications in mycelial growth, the greatest variation occurring in old, well-developed cultures.

Pigmentation and pycnidial formation were also considerably affected by nutrition. The latter decreased in the absence of sulphur and ceased altogether when magnesium was not present. Chlamydospores were usually formed in stale cultures in solutions containing a limited quantity of nutrients.

These investigations show that *P. obtusa* generally prefers high concentrations of nutrients and the author considers that this may be related to its habit of attacking the parenchymata of fruits, leaves, and twigs, where the concentration of cellular fluid is higher than in the vessels.

OSTERWALDER (A.). **Die Macrophoma-Fäulnis der Aepfel.** [The *Macrophoma* rot of Apples.]—*Landw. Jb. Schweiz*, xlix, 5, pp. 565–570, 1 fig., 1935. [French summary.]

French Pippin apples used in a storage experiment at the Wädenswil Fruit-Growing Institute during the winter of 1934–5 developed an unfamiliar type of decay, frequently commencing at the stalk and characterized in the early stages by a partial lilac-coloured discoloration of the flesh, later turning black and involving the skin. The fungus isolated from the diseased fruit formed a profusely anastomosing mycelium, which turned black in two to three weeks, but no spores were produced either on the apples or in culture. Inoculation experiments on six apple varieties gave positive results.

On the stalks of certain varieties, e.g., Beauty of Boskoop, pycnidia occurred with hyaline, cylindrical to elliptical or obtuse-conical spores, 26·6 to 28·7 by 11·5 to 12·3 μ and hyaline, cylindrical, pycnidial sporophores, 12 to 16 by 3·3 to 3·7 μ. On nutrient gelatine a single spore culture developed the typical mycelial stage of the apple fungus as described above, and inoculations with pure cultures from this source were successful on six varieties. The pycnospores germinate readily in water, forming a lengthy germ-tube in 24 hours. The morphological characters of the fungus suggest a relationship with *Macrophoma malorum* [*Botryodiplodia malorum*: see preceding abstract], and Delacroix's inclusion of this species in *Sphaeropsis malorum* Peck [*Physalospora obtusa*] is not acceptable to the writer on the ground that the ripe spores exuded from the pycnidium remain hyaline and smooth. *Phomopsis mali* [*R.A.M.*, xiii, p. 107] resembles the fungus under observation in its subepidermal development, but its spores measure only 7 to 10 by 2 to 4 μ. The usual mode of entry of *M. malorum* into the fruit is evidently by way of the stalk, but some of the apples examined had been attacked without any sign of stalk infection.

VERNER (L.). **A physiological study of cracking in Stayman Winesap Apples.**—*J. agric. Res.*, li, 3, pp. 191–222, 3 figs., 1 graph, 1 diag., 1935.

The results of field observations in 1932–3 and of laboratory experiments in 1933–4 with Stayman Winesap apples in West Virginia did not support the hypothesis advanced by some earlier workers that cracking of the fruit [cf. *R.A.M.*, ix, p. 253], which in certain seasons and in certain localities may cause serious losses to the growers, is chiefly caused by sudden, considerable increases in soil moisture. While the trouble did not appear to stand in any relationship to fluctuations in air temperature, it was found that outbreaks of cracking were usually preceded by a period of greatly depressed transpiration of the trees, maintained for six hours or more, and though rainfall was naturally confined to such periods, cracking was correlated with slow evaporation rather than with rainfall. The presence of water on the fruit or foliage was apparently not necessary for the development of the disorder, which, however, occurred severely on apples still attached to the branch when immersed in water for several days. There was also evidence that cracking was more pronounced and extensive when the foliage was sparse than when it was dense. On individual apples it occurred chiefly at points showing some surface abnormality, such as russeting, sunscald, high coloration, and the like, the cortical tissues underlying which were shown to have a considerably higher osmotic pressure than the rest of the fruit.

CHAUDHURI (H.) & NATH (P.). **Studies in the diseases of Apples in northern India. I. A new leaf-spot disease of Apples caused by Oothecium indicum n.sp.**—*J. Indian bot. Soc.*, xiv, 2, pp. 101–107, 1935.

From the purplish to rusty spots on apple leaves in crowded orchards in Kashmir the writer isolated on potato-glucose agar and other media a fungus characterized by anastomosing hyphae, 1·9 to 7·7 μ in diameter, globose, thick-walled, non-ostiolate pycnidia, 110 to 357·5 by

96·5 to 343·8 μ, containing numerous elliptical, lemon-shaped, or slightly curved, continuous, dark brown, smooth spores, 5·2 by 3·3 μ, borne either on extremely short conidiophores or directly on the inner wall of the pycnidium and escaping by the rupture of the wall. The absence of a stroma and ostiole definitely place the organism in the genus *Oothecium*, hitherto represented by only one species, *O. megalosporium* Speg., from which the apple fungus differs in pycnidial and spore dimensions and other characters. The latter is accordingly named *O. indicum* n.sp. [without a Latin diagnosis]. A table is given showing the growth characters of the fungus on the various substrata used. Development was more rapid in darkness than in light, the latter being requisite, however, for pycnidial formation. The growth of the organism was favoured by a humid atmosphere. It was killed by ten minutes' exposure to an atmosphere of 52° C.

DIPPENAAR (B. J.). **Studies in 'Kelsey spot' on Plums.**—*Fmg S. Afr.*, x, 113, pp. 333–336, 5 figs., 1935.

The Kelsey and other South African plum varieties suffer from three different types of spotting, namely, sun spot, Kelsey spot, and drought spot [*R.A.M.*, xi, p. 521]. The first-named invariably develops from the surface of the plum inwards within a day or two of the onset of extremely high temperatures and bright sunlight. The affected fruit presents the appearance and sometimes the taste of having been cooked. Kelsey spot may occur either on the exposed or sheltered side of the fruit in the form of superficial reddish lesions overlying deep-seated, brown, necrotic spots or lens-shaped cavities. This disorder develops some five days after a very hot spell (up to 90·5° F.) and three to four weeks before picking for export generally begins. Drought spot appears much earlier, and scarcely ever affects more than 2 to 3 per cent. of the fruit on a tree. A correlation was established between the direction of the sun's rays and the incidence of Kelsey spot, 43·2 per cent. of which developed on the northerly and only 8·3 per cent. on the southerly side of the plums. In an experiment in which the plums were stored for varying periods in an incubator the temperature of the fruit was found to rise very slowly. The critical temperature for the development of internal brown spots and cavities was shown to lie between 115° and 120°, and from the fact that such temperatures prevail in the orchard in late January it is concluded that sudden excessive heat is the primary cause of the sun and Kelsey spots, and probably also of drought spot. Heat spot' would therefore be the correct designation for all three types.

DUNEGAN (J. C.). **A Phytophthora disease of Peach seedlings.**—*Phytopathology*, xxv, 8, pp. 800–809, 2 figs., 1935.

Nursery peach trees at Bentonville, Arkansas, have been attacked of recent years by a destructive disease starting with the formation on the stem, well above the soil line, of a small, light brown lesion, which rapidly enlarges into a water-soaked canker 2 to 10 cm. long, sometimes extending downwards to the soil line. The tissues of the affected region are sunken, and gum is frequently exuded in profusion through epidermal fissures. As the canker progresses round the stem the terminal leaves develop a red discoloration and fail to unfold completely.

During the early stages of the disorder the root system remains healthy, and the root discoloration appearing after the death of the top is considered to be a purely secondary effect. Occasionally the shoot arising from a bud inserted in the autumn was observed to contract infection in the following spring, the symptoms in such cases being similar to the foregoing, except for a tendency of the shoots to collapse in the final stages.

A study of the local meteorological data in relation to the peach disease has shown that infection is favoured by heavy rainfall and cloudy weather during the early part of the growing season.

The fungus isolated from diseased material and grown in pure culture on maize meal agar was characterized by a long mycelium composed of profusely branching hyphae, 2 to 10 μ in diameter, on the slender branches of which ovate or variable, papillate sporangia, 30 to 45 by 24 to 36 μ in diameter, are sympodially produced; these germinate by a germ-tube and not, so far as is known, by zoospores. Tubular to spherical, mostly paragynous antheridia, subspherical, hyaline to pale yellow oogonia, 32 to 38 μ in diameter, and thick-walled, yellowish oospores, 25 to 30 μ in diameter, are formed in abundance on maize meal and Lima bean agar. The minimum, optimum, and maximum temperatures for the growth of the fungus were found to be 5°, 21° to 26°, and 32° C., respectively; the hydrogen-ion concentration permitting development ranged from P_H 4·0 to 9·0. In morphological and cultural characters the organism agrees closely with *Phytophthora cactorum* [*R.A.M.*, xiii, p. 783], to which it is accordingly referred. Its pathogenicity was demonstrated by a series of inoculation experiments resulting in the development of typical wilt symptoms in the test plants, the inoculations being made through wounds or by covering the soil with a mixture of sand and inoculated bran.

A histological study of the cankers showed the activity of the fungus to be confined to the cortex and cambium. Gum pockets are formed in the phloem region, while the outer parenchyma tissues disintegrate into a dark, discoloured mass resting on the cortical fibres.

The location of nurseries in well-drained sites appears to be the sole practicable control measure.

SMART (HELEN F.). **A new bacterial species isolated from Strawberries.**—*J. agric. Res.*, li, 4, pp. 363–364, 1935.

A description is given of the morphology and cultural characters of a bacterium, which in 1929 and 1930 was isolated in large numbers from many samples of fresh strawberries from four localities in the United States [cf. *R.A.M.*, xiv, p. 322]. The organism, which is named *Achromobacter delmarvae*, occurred chiefly on the outside of the fruit, and, so far as the author is aware, it has no bad effect upon the texture, flavour, appearance, or wholesomeness of the strawberries.

LEACH (R.). **Insect injury simulating fungal attack on plants. A stem canker and angular spot, a fruit scab and a fruit rot of Mangoes caused by Helopeltis bergrothi Reut. (Capsidae).**—*Ann. appl. Biol.*, xxii, 3, pp. 525–537, 2 pl., 3 diags., 1935.

The investigation briefly reported in this paper showed that the

Capsid insect *Helopeltis bergrothi* is the direct cause of four different diseases of the mango in Nyasaland [cf. *R.A.M.*, xiv, p. 561]. On the stem it causes cankers which appear as water-soaked, green, oblong-ovate lesions averaging 11 by 3 mm. in diameter, in the otherwise copper-coloured stem, and within 24 hours the lesions become slightly sunken and turn yellow-brown at the edges, but later they are either flush with the surface or slightly raised; occasionally they may be deeply cracked, causing open wounds in the stem. A bead of sap is often exuded from a fresh puncture and forms an ideal point of entry for bacteria and fungi (*Colletotrichum* spp. and *Phoma* spp.) to invade the cortex, which then becomes necrotic and blackened, 90 per cent. of the cankers being thus affected in damp and 30 per cent. in dry weather. Fungus fructifications may be present on the surface. On the leaves the insect causes an interveinal angular leaf spot, from 1 to 4 mm. in diameter, becoming a light yellow-brown with slightly darker edges in four to five days; occasionally the spots fall out, giving a shot-hole appearance to the leaf. On the fruits it gives rise either to a scab, when the stylets do not penetrate beyond the outer skin, or to a wet rot, when they reach into the middle skin; the rot spreads throughout the fruit in a manner extraordinarily like that of a rot caused by a fungus or a bacterium.

A black scab of avocado pear [loc. cit.] in Nyasaland, very similar in appearance to mango scab, has also been proved to be caused by the same insect.

Menzel (K. C.). **Untersuchungen der schädigenden Wirkungen kupferhaltiger Spritzmittel.** [Investigations on the injurious effects of copper-containing sprays.]—*Angew. Bot.*, xvii, 4, pp. 225–253, 7 figs., 1935.

An account is given of the writer's experimental observations in Schleswig-Holstein and Saxony on the nature of the injuries inflicted on apple and pear trees and certain test plants by spraying with Bayer's Bordeaux mixture (1 to 4 per cent.) [*R.A.M.*, xiv, p. 701], a home-made Bordeaux mixture, copper sulphate, and copper acetate.

The effects of spraying on the leaf structure was studied on *Pelargonium zonale*, *Impatiens sultani*, *Symphoricarpos racemosus*, and the susceptible Beauty of Boskoop apple variety. The first effect of the treatment on the leaves is a contraction of the cell-walls, the spongy parenchyma being thickened and the intercellular spaces largely eliminated, while here and there the cell contents begin to agglomerate and the palisade cells shrink. These changes are confined to the areas in actual contact with the fungicide and do not persist if the deposit is thoroughly washed off. Sudden wilting of the sprayed foliage may, however, result from an abrupt rise of temperature, which promotes the penetration of the copper, at this critical early stage. Even in the case of more severe scorching, involving the death of the cells, the damage may be restricted to a small area of tissue. The disintegrated cells are of a greenish-brown colour, or occasionally pure arsenic-green. The order of susceptibility to spraying injury in the leaf tissue is as follows: lower epidermis, upper epidermis, spongy parenchyma, and palisade parenchyma, the last-named being barely affected. Where

the injury is severe the entire tissue from the upper to the lower epidermis is destroyed and becomes separated from the healthy tissue by a wound layer. A greenish-brown or arsenic-green discoloration of the vascular bundles was also observed, frequently spreading into the interior of the leaf.

It was ascertained that pears and certain apple varieties, e.g., Horneburger Pfannkuchen [Pancake] and Schur, the leaves of which have a high osmotic value (osmotic pressure over 38, 26, and 29·7 atmospheres, respectively), are almost or quite insensitive to copper injury, whereas apples such as Gravenstein, Beauty of Boskoop, and Croncels Transparent with low osmotic values (5·3, 8·2, and 13·7, respectively), are liable to much more severe damage. Synthetic fertilizers, which tend to raise the osmotic values of the plants, simultaneously reduce their liability to copper injury. Heavier damage is to be anticipated on non-bearing than on bearing fruit-trees for the following reasons: (1) the copper-resistant palisade layers are reduced while the susceptible spongy parenchyma is profusely developed; (2) the epidermis is thinner; (3) osmotic values are lower; and (4) there is a high proportion of small, readily injured vessels. Sprayed leaves were found to wilt more slowly and transpire less freely than untreated ones. The injurious effects of copper sulphate, copper chloride, and copper acetate mixtures were found to be identical in nature, but it is highly probable that they differ in degree, though actual evidence on this point is not yet forthcoming.

Sprøjte og Pudderskade. [Spraying and dusting injury.]—*Medd. Forsøgsv. Plantek. Kbh.* 239, 4 pp., 1935.

An account is given of the damage inflicted on Danish orchard fruits by various standard fungicides [cf. *R.A.M.*, xiii, p. 358 *et passim* and preceding abstract], the reaction of 43 apple varieties to which is shown in tabular form. Bordeaux mixture ($\frac{1}{2}$: 1: 100 or 1: 1: 100) causes severe damage to Adams' Pearmain, Beauty of Boskoop, Cox's Orange and Cassel Pippins, and a number of others, while among those suffering from the use of lime-sulphur (2: 100) or sulphur dust are Frogmore, Hawthornden, Lane's Prince Albert, and Lord Grosvenor. Bouisol and sulsol [ibid., xiv, pp. 533, 560] cause approximately the same amount of damage as $\frac{1}{2}$: 1: 100 Bordeaux and 2: 100 lime-sulphur, respectively. Pears are in general less susceptible than apples to spraying injury, but defoliation of Bonne Louise, Clapp's Favourite, Comice, Moltke, Williams' [Bon Chrétien], and others may follow lime-sulphur treatments, while Josephine de Malines and Nelis leaves are sensitive to Bordeaux. In 1934 several varieties, notably Tongres, bore severely shrivelled fruits as a result of post-blossom applications of $\frac{1}{2}$: 1: 100 Bordeaux. Cherries seem to tolerate the regulation spray schedules very well, but the summer treatment of Victoria, greengage, and other plums may distort and discolour the foliage. Dormant treatments may generally be safely given in Danish orchards up to 1st March.

Robertson (W. C.). **Lime sulphur-wash and powders.**—*J. Dep. Agric. Vict.*, xxxiii, 8, pp. 386–391, 2 figs., 1935.

Recent analyses of different brands of commercial lime-sulphur on

the Melbourne market in comparison with the farm-made product and four samples procured from England indicated that the standard established by the Fungicides Act of 1920 is far too low [cf. *R.A.M.*, xiii, p. 315; xiv, p. 598]. Under the proposed legislation at present (August) before Parliament manufacturers of liquid lime-sulphur will be obliged to register their brands with the Department of Agriculture, including an analysis of the mixture. The analytical data further suggest the basing of standardization on the percentage of soluble sulphur in the mixture plus the percentage of soluble sulphur present as free poly-sulphide sulphur. Notes are also given on the preparation of self-boiled lime-sulphur and dry-mix sulphur-lime. Dry lime-sulphur—the residue left on evaporating the concentrated liquid to dryness—has the great advantage of saving freight but is little used in Victoria.

BARNES (B.). **Presidential address. Induced variation.**—*Trans. Brit. mycol. Soc.*, xx, 1, pp. 17–32, 1935.

In his presidential address to the British Mycological Society in 1935, the author presented selected data, culled from the relevant literature, and also resulting from his own mycological work [*R.A.M.*, x, pp. 331, 613], showing that definite variations can be and have been brought about artificially in living organisms (animals, insects, plants, bacteria, and fungi) by submitting them to the action of chemicals, high temperatures, X-rays, radium emanations, and ultra-violet light. The phenomena involved in such variations are far from simple, and it is probable that they cannot be brought under one explanation. While the nature of the change induced in the constitution of the variants still remains obscure, it seems highly probable that some nuclear change, and some mixing of nuclei of different qualities, must be concerned in a sectoring mycelium [ibid., xii, p. 782; xiv, p. 710], and in induced chimaeras in higher plants. The similar effects, however, which follow heat treatment and age, among other things, suggest that apart from nuclear changes, a general derangement of the physiological balance of the cell may also be responsible for variation.

List of cultures, 1935, Centraalbureau voor Schimmelcultures, Javalaan 4, Baarn, Holland.—106 pp., 1935.

In the introduction to this list of cultures at the Centraal-bureau voor Schimmelcultures, Baarn, Holland, the author states that at the end of 1934 the total collection amounted to 4,802, including 668 yeasts; in the same year 563 units were added, as against 468 in 1933.

The Bureau receives 63 per cent. of its income from various Dutch institutes, 31 per cent. from subscriptions and the sale of cultures, and the remainder from l'Union Internationale de Biologie, Section botanique. As the sale of cultures has declined owing to the straitened resources of many institutions and the complications of international money exchange, the financial position of the Bureau is, it is stated, becoming increasingly difficult, and it will not be possible to keep up the work unless additional financial support is forthcoming.

Mycologists and phytopathologists are earnestly requested to send to Baarn any species not mentioned in this list; cultures are obtainable in exchange.

Vaviloff (N. I.). Учение об иммунитете растений к инфекционным заболеваниям. [The theory of plant immunity from infectious diseases.]—101 pp., 2 col. pl., Госуд. Издат. Совхоз. и Колхоз. Литер. [State Publ. Off. Lit. Collect. & Co-op. Farming], Moscow, 1935.

This book is stated in a short preface to be the first attempt to supply the Russian plant breeder with a critical review of all the work done, both in Russia and abroad, on the various aspects of plant immunity from infectious diseases since the publication in 1919 of the author's treatise of plant immunity up to the beginning of 1934. It gives, among other matters, a comprehensive review of the study of inheritance of resistance in cereals and other important crops to virus, bacterial, and fungal diseases, and also to diseases caused by insects, besides touching on the theoretical aspects of plant immunity. The important bibliography appended at the end of the work covers 20 pages.

Budrina (Mme A. P.), Dobrozrakova (Mme T. L.), Karakulin (B. P.), Naoumoff (N. A.), Rudenko (D. K.), Stepanoff (K. M.), Tverskoy (D. L.), Tupinevitch (S. M.), & Khetagurova (Mme F. V.). Фитопатология [Phytopathology.]—340 pp., 132 figs., 1 graph, 5 maps, Госуд. Издат. колх.-совх. Литер. [State Publ. Off. Lit. Collect. & Co-op. Farming], Leningrad, 1935.

This is a somewhat elementary manual of phytopathology intended for students at the Russian agricultural schools and experimental stations, the separate chapters of which are compiled by one or other of the authors specializing in the subject treated, under the general editorship of Professor Naoumoff. The first part gives the general principles of diagnosis of physiological, parasitic, and virus diseases of plants, with morphological and taxonomic accounts of the causal organisms or agencies, and a brief discussion of plant immunity from disease. The second and third parts give a somewhat fuller account of the more important diseases of the chief crops cultivated in U.S.S.R. [exclusive of ornamental plants and forest trees], and the fourth deals with control methods, including the phytopathological examination of seeds and their disinfection.

Cottam (C.). **Further notes on past periods of Eelgrass scarcity.**—*Rhodora*, xxxvii, 440, pp. 269–271, 1935.

Further evidence has now been accumulated concerning past periods of eelgrass [*Zostera marina*] scarcity [*R.A.M.*, xiii, p. 647], e.g., along the Atlantic coast of North America and in France in 1893–4 and in 1878–9 and 1880–1 in Great Britain, none of which, however, appears to have been comparable to the present disastrous shortage. Recent observations along the Atlantic coast from southern North Carolina to Fundy Bay, between the eastern extremity of Maine and Nova Scotia, indicate that in most sections conditions are still very unsatisfactory—worse in fact locally than a year ago. Some improvement, however, is noticeable in areas of reduced salinity [ibid., xiv, p. 709] and in the more southerly latitudes.

HART (L. P.). **Development of mildew-resisting paints.**—*Paint Varn. Prod. Mgr*, xiii, 12, pp. 14–15, 2 figs., 1935.

A note is given on the precautions to be taken in the application of paints to a mildewed exterior surface [cf. *R.A.M.*, xiv, p. 520]. The addition of zinc oxide to the paint reduces the incidence of mildew, while mercuric chloride, phenol mercury acetate, and 'ammoniated mercury' [$HgNH_2Cl$] in proportions of 1: 500 to 900 are also effective. Red copper oxide may be used for the same purpose in red and brown paints and Paris green in green ones.

HYDE (R. R.). **An interpretation of the filterable viruses.**—*Amer. J. Hyg.*, xxi, 2, pp. 472–481, 1 diag., 1935.

The writer considers that twenty well-known virus diseases, including tobacco mosaic, should be definitely placed in a category apart from all others by reason of two important distinguishing features, viz., (1) the formation within certain cells of the host of characteristic inclusion bodies, and (2) the capacity of the causative agents to traverse filters retaining the microscopic forms of life [cf. *R.A.M.*, xiv, p. 722]. The term 'filterable viruses' should, it appears, be retained for the present on account of its generally established use, but filterability is not a fundamental property, for it depends on the nature of the filter used. Moreover, it is necessary to distinguish between filterable viruses and merely filter-passing bacteria.

Discussing the evidence for and against the 'living' nature of the filterable viruses [cf. ibid., xiii, p. 717; xiv, p. 260 *et passim*], the writer finds support for the theory in the fact that some of these agents are specifically adapted to a certain host, while in other cases, such as aster yellows [ibid., xiv, p. 312], an incubation period in an insect is requisite.

In conclusion the author draws attention to some striking contrasts between the filterable viruses and bacteria and expresses the view that a filterable virus, in the modern conception, is an agent of particulate nature, of ultramicroscopic dimensions, capable of passing filters retaining the vegetative forms of parasitic life, transmissible in series to sensitive hosts, producing typical inclusion bodies, not cultivable on lifeless media, and recognizable solely by the changes it causes in the bodies of man and animals and in plants.

OTERO (J. I.) & COOK (M. T.). **First supplement to partial bibliography of virus diseases of plants.**—*J. Agric. Univ. P.R.*, xix, 2, pp. 129–313, 1935.

This first supplement to the authors' partial bibliography of the literature of plant virus diseases [*R.A.M.*, xiv, p. 51] contains a large number of additional titles, many accompanied by a note indicating the scope of the work referred to. Useful indexes of authors and subjects to both the supplement and the original bibliography are appended, and there is a 13-page list of corrected errata to the latter.

SAMUEL (G.), BEST (R. J.), & BALD (J. G.). **Further studies in quantitative methods with two plant viruses.**—*Ann. appl. Biol.*, xxii, 3, pp. 508–524, 1 pl., 1 graph, 1935.

This is a tabulated account of the authors' study of some of the

factors which influence the estimation by the primary lesion method of the concentration of the viruses of tobacco mosaic 1 and of spotted wilt of tomato [*R.A.M.*, xiii, p. 662 *et passim*]. The work necessitating the comparison of as many as a dozen virus samples at a time, they adopted an arrangement of the experiments which allowed the comparisons to be made by the half-leaf method [ibid., xii, p. 527] in randomized blocks and Latin squares, which, for statistical convenience, presents a definite advantage over the leaf unit method recommended by Youden and Beale [ibid., xiv, p. 197]; in some cases, however, they also used the latter method, as giving the best results without the extra labour involved by the former. Some improvements were made in the technique of inoculation, the chief one being the increase of the ground glass spatula [ibid., xii, p. 527] from $1\frac{1}{4}$ to $1\frac{1}{2}$ in. in length, in order to fit comfortably across half of all except the largest leaves. It was shown that provided there is sufficient inoculum to cover the leaf when the spatula is rubbed over it, the amount of inoculum makes no difference to the number of lesions produced. It was further shown that the *Nicotiana glutinosa* plants used in the experiments gave the largest number of lesions when they were kept for 24 hours prior to inoculation in a basement at an approximately constant temperature.

The results of the comparative inoculations showed that the number of lesions produced by otherwise similar inocula varied with their P_H value and electrolyte content. The virus of spotted wilt of tomato produced on tobacco few lesions or none at all at P_H values below 5 and above about 9·2, while between 6 and 8·5 there appeared to be relatively small differences in the number of lesions produced by otherwise similar inocula, and at these values the inocula underwent very little change over a period of about three hours; occasionally, however, significant differences did occur within these limits. Tobacco mosaic virus also gave few lesions on tobacco with inocula at very low and very high P_H values. The inactivating action of cysteine hydrochloride [ibid., xiii, p. 662] is explained by these results since the P_H of the solution must have had a value about 2. The maximum number of lesions was produced by the tobacco mosaic virus in a potassium phosphate solution at concentrations ranging between 0·05 and 0·2 *M*. These results indicate that the viruses used in quantitative work should be buffered at a definite P_H value. It is pointed out, however, that when the effects due to varying P_H value and electrolyte content were excluded, the virus of tomato spotted wilt was still inactivated by certain oxidizing agents and preserved by certain reducing agents.

CAPPELLETTI (C.). **Sulla fruttificazione basidiofora dell'Hypochnus catonii (Burgeff).** [On the basidiophoral fructification of *Hypochnus catonii* (Burgeff).]—*Nuovo G. bot. Ital.*, N.S., xlii, 1, pp. 265–266, 1935.

In a culture of *Cymbidium* seeds contaminated by *Cladosporium herbarum* the author observed basidial fructifications of *Hypochnus catonii* Burgeff [*R.A.M.*, viii, p. 589; xi, p. 317] in the mycelial weft mixed with the *C. herbarum*. The ovoid, fusiform basidia corresponded with those described by Catoni and were furnished with a variable number of narrow sterigmata bearing easily detachable, hyaline spores. The hyphae were generally moniliform and clamp-connexions were

observed. The presence of *C. herbarum*, besides causing the formation of the fructification of *H. catonii*, which did not occur in 20 other uncontaminated cultures, stimulated the development of the protocorms of the *Cymbidium* in the immediate vicinity.

Horowitz-Vlassova (Mme L. M.) & Livschitz (M. J.). **Zur Frage der Wirkung der Mikrobe auf Fette.** [On the question of microbial action on fats.]—*Zbl. Bakt.*, Abt. 2, xcii, 20–23, pp. 424–435, 1 fig., 1935.

Numerous fungi of the genera *Penicillium*, *Aspergillus*, *Sterigmatocystis*, &c., as well as bacteria are capable of splitting fats and oils [cf. *R.A.M.*, xiv, p. 604]. The lipolysis induced by fungal activity is characterized chiefly by the marked rise in the acid number of the fat phase, whereas glycerine is never detectable in the cultures owing to its ready fermentability. To a limited extent certain fungi, e.g., *S. nigra* [*A. niger*], *Citromyces pfefferianus*, and *Mucor racemosus* are able to disintegrate fats and oils by oxidation, a process characterized by the following features: formation of peroxides, oxy-acids, aldehydes, presence of lightly fixed oxygen, increase of the acid number of the water phase, reduction of the iodine number, and rise of the refractometric index. Fungal lipase and the oxidation-inducing ferment, to which the name 'lipoxidase' is applied, cannot be detected in the nutrient medium but may be found in the mycelium.

Leonian (L. H.). **The effect of auxins upon Phytophthora cactorum.**—*J. agric. Res.*, li, 3, pp. 277–286, 4 figs., 1935.

The results of the experiments described in this paper showed that while *Phytophthora cactorum* [see above, p. 35] makes no growth whatever when transferred to a solution consisting of the essential mineral salts and pure sugar (dextrose), the addition to this solution of a piece, about 1 in. in length, of the primary root cut from an aseptically germinating maize grain induces an excellent growth of the fungus and the formation of both sexual and asexual reproductive organs. This effect is attributed to a growth-stimulating substance in the maize root, which on circumstantial evidence is believed to be an auxin. Further experiments indicated that this substance moves in the root from the tip to the base, and that the amount of it diffused from an uncut root is negligible. The substance given off by the cut root does not induce growth of the fungus in the absence of the essential mineral salts and sugar; it withstood very rough treatment, including autoclaving, boiling of the maize root in 20 per cent. sulphuric acid, and the action of many toxic substances and protein precipitants, as well as the action of X-rays. Auxin solutions treated with 4 per cent. norit, an excellent adsorbing agent, no longer promote growth, since the growth-promoting substances are adsorbed, but such solutions still promote sexuality. In addition to the growth-promoting substances, therefore, there are sexuality-promoting factors which apparently possess different properties.

Muncie (J. H.). **Yellow dwarf disease of Potatoes.**—*Spec. Bull. Mich. agric. Exp. Sta.* 260, 18 pp., 7 figs., 1935.

Yellow dwarf of potatoes [see above, p. 3], first recognized in

Michigan in 1927, is stated to be now of considerable importance in the State, where the losses from this source frequently amount to 15 or 25 per cent. of the crop and in exceptional cases may involve a reduction of yield of 75 to 90 per cent. The disease causes severe damage to the Green Mountain, White and Russet Rurals, Russet Burbank, Irish Cobbler, and Katahdin varieties, and has also been observed on Bliss Triumph, Carman No. 3, Polaris, and Chippewa.

The symptoms of yellow dwarf are described [*R.A.M.*, i, p. 449]. The affected plants commonly range from 3 to 12 in. in height and have slightly thickened, brittle, yellowish foliage attached at an acute angle to the thickened stem. In severe cases the leaves are small and slightly curled, and the somewhat unusually dark green of the early stages is replaced in turn by a grey-green, dull yellow, and brown discoloration, similar changes taking place in the stem. On larger plants, the first signs of the disease are the yellowing and dying of the axillary buds near the tip of the stem or the pinching and marginal bronzing of the apical leaflets. Later the yellowing extends to the older leaves. In large plants with two or three stems arising from a single tuber, only one may show distinct yellow dwarf symptoms, but all the tubers from such a hill may produce diseased plants. A brown flecking of the pith at the growing tip of the stem [ibid., xii, p. 187], sometimes extending downwards and being most conspicuous at the nodes, is a marked feature of the disease. Severely diseased plants produce small, misshapen, often cracked and spotted tubers closely attached to the stem.

Under local conditions yellow dwarf occurs in the most virulent form in light, sandy soils during seasons of high temperature and low precipitation. At 60° to 70° F. the symptoms of yellow dwarf in greenhouse plants were largely masked, developing in an acute form only on the raising of the day and night temperatures to 75° to 90° and 60° to 75°, respectively [ibid., iv, p. 501].

Details are given of experiments in the transmission of the yellow dwarf virus by various methods, of which tuber grafting and insects, especially *Empoasca fabae* and *Macrosiphum solanifolii* [*M. gei*], proved the most effective, the results of soil, needle inoculation, and hypodermic injection tests being inconclusive. The clover leaf hopper, *Agallia sanguinolenta*, found by Black to be an active carrier of yellow dwarf [ibid., xiii, p. 721], occurs in abundance in Michigan in potato, clover, and lucerne fields, and the rapid spread of the disease may be in part attributable to the regular cultivation of lucerne over considerable areas in close proximity to potatoes.

Control measures should include the use of healthy seed, regular roguing at 10- to 14-day intervals throughout the growing season, and spraying at similar intervals with 8-12-100 Bordeaux mixture.

Köhler (E.). **Der Nachweis von Virusinfektionen am Kartoffelpflanzgut mit der Stecklingsprobe.** [The detection of virus infections in seed Potatoes by testing the sprouted eyes.]—*Züchter*, vii, 3, pp. 62–65, 4 figs., 1935.

Details are given of a modified form of the tuber-indexing method for the diagnosis of potato virus diseases [*R.A.M.*, xiv, p. 714] which is in use at the Biological Institute, Berlin. From the beginning of

January onwards the tubers are placed in a subdued light until the 'eyes' are sufficiently developed to be excised with an appropriate quantity of flesh and serve as cuttings. Extreme care must be taken during these operations not to transmit virus infections from one tuber to another, and in order to promote the suberization of the wound surface the cut tubers should be left overnight in a moist atmosphere. The tubers and corresponding eyes are consecutively numbered and the former set aside until required, while the latter are closely planted in shallow boxes. Early in February the boxes are placed in a well-lighted greenhouse and periodically fumigated. With practice it can readily be decided within eight weeks which tubers are fit for planting. In many cases the nature of the virus is obvious, e.g., in leaf roll which induces on the under side of the leaves the formation of anthocyanin spots. By means of inoculations on susceptible tobacco seedlings the various mechanically transmissible mosaic viruses may be determined and mixed infections by these recognized [ibid., xiv, p. 388]. At the same time light is thrown on the presence in the potato of latent viruses which may become significant when joined in the field by another infective principle and tend to cause tubers harbouring them to deteriorate rapidly under favourable ecological conditions [cf. ibid., xiv, p. 650]. For instance Magnum Bonum, Erstling [Duke of York], and Up-to-Date are consistently infected to a greater or lesser extent by ring mosaic, of which they are ordinarily so tolerant as to suffer little damage. Transferred to a 'degeneration-inducing' environment, however, such varieties are liable to virulent attack by mixed infections.

CLARIDGE (J. H.). **The identification and purchase of certified seed Potatoes.**—*N.Z. J. Agric.*, li, 2, pp. 107–108, 1935.

To assist purchasers of seed potatoes in New Zealand to identify Government-certified seed [*R.A.M.*, vii, pp. 387, 736] the author explains that the work falls into two stages, (1) provisional certification, merely showing that the growing crop after inspection for diseases and varietal purity has been found satisfactory, and (2) final certification after examination of the produce from a provisionally certified crop. Provisionally certified seed may be sold, but without guarantee, other than the word of the vendor, whereas every sack of finally certified seed bears an official tag. Arrangements have now been made for the final certification of quantities of 14 lb., 28 lb., or 56 lb. packed in standard crates.

SCHLUMBERGER [O.]. **Die Produktion krebsfester anerkannter Pflanzkartoffeln im Jahre 1933.** [The production of wart-immune certified seed Potatoes in the year 1933.]—*NachrBl. dtsch. PflSch-Dienst*, xv, 8, pp. 73–75, 1935.

A tabulated account is given of the production of seed potatoes immune from wart disease (*Synchytrium endobioticum*) in Germany in 1933 [cf. *R.A.M.*, vii, p. 50; viii, p. 523; xiv, p. 651], from which it appears that these varieties comprised 57·8 per cent. of the total material submitted for certification compared with 54·43 per cent. in 1932 and only 28·8 per cent. in 1927. The number of officially recognized wart-immune varieties is now 101, 54 relatively unimportant sorts

having been eliminated by the Reich Food Board. Among the well-known wart-immune varieties showing a falling-off in 1933 were Juli and Erdgold, while an increase was registered for Kaiserkrone, Preussen, Parnassia, Stärkereiche [Starchy] I, and a number of others. Among the susceptible varieties Industrie and Allerfrüheste Gelbe covered a smaller area in 1933 than in 1932, whereas the production of Erstling [Duke of York] and Odenwälder Blaue increased slightly.

Small (T.). **Potato blight (Phytophthora infestans) investigations in Jersey. Prevention of disease in export produce.**—*Ann. appl. Biol.*, xxii, 3, pp. 469–478, 1935.

The experiments briefly reported in this paper showed that the losses in potatoes exported from Jersey to England are chiefly due to contamination of the tubers at digging time (which is early, while the haulm is still green) with the spores of *Phytophthora infestans* and to packing infected but outwardly normal tubers from which the fungus can spread to healthy ones. The variety grown is International Kidney, which is very susceptible to the disease and, apart from export losses, diseased tubers rejected in the field account for a reduction of 5 to 20 per cent. in the yield. Loss from damage to the foliage is not usually important. Losses may be avoided in a large measure by regular and thorough spraying until the tubers are formed, when the crop should be dug at once, or the haulms cut or scorched. The amount of disease in transit was reduced by ventilation [*R.A.M.*, xiii, p. 592]. It was further shown that barrels which have already contained diseased potatoes present little or no damage. Scorching the green potato haulms in the field [ibid., xiv, p. 789] was very effectively done in Jersey with a dilution of 3 to 4 galls. commercial sulphuric acid in 40 galls. water.

Crosier (W.) & Reddick (D.). **Some ecologic relations of the Potato and its chief fungous parasite, Phytophthora infestans.**—*Amer. Potato J.*, xii, 8, pp. 205–219, 1935.

Summarizing the results of their own observations and experiments in New York and those obtained by other American and European workers, the writers find that temperature and humidity are the chief external factors in the rapid spread of late blight of potatoes (*Phytophthora infestans*) [*R.A.M.*, xiv, p. 715]. A relative humidity of 95 per cent. or above must be maintained for about eight hours to permit the production of a germinable sporangium, while rain or dew are necessary for the initiation of germination, swarming, and infection. Chilling is essential to stimulate sporangial germination. When external factors become operative at the critical moment for the optimum development of the parasite a very high degree of humidity must persist for 11 or 12 hours at least to permit infection.

In seasons when late blight is negligible or absent, tuber rot may occur in isolated hills by direct mycelial infection through the soil. Thus the fungus is perpetuated and the disease may again become widespread in the following year. Owing to the sensitiveness of the sporangia of *P. infestans* to desiccation the spread of late blight from a given centre is so slow as to preclude the migration of the fungus on

a scale that would explain the development of simultaneous outbreaks of the disease in widely separated areas.

SCHAAL (L. A.). **Rhizoctonosis of Potatoes grown under irrigation.**—*Phytopathology*, xxv, 8, pp. 748–762, 2 figs., 1935.

Rhizoctonosis of potatoes (*Corticium vagum*) [*C. solani*] is stated to be responsible for heavy damage in the irrigated areas of the Greeley district of Colorado. The stem infection phase of the disease [*R.A.M.*, ix, p. 671] chiefly affects the early-crop varieties, Bliss Triumph, Irish Cobbler, and Early Ohio, grown in cool soil. In a series of experiments on Bliss Triumph covering the period from 1930 to 1932 the most severe infection occurred among the stands planted in early April. For instance, of 60 stems examined six weeks after planting on 8th April, 1932, 44 were attacked, whereas little injury was observed among the plantings made after 1st May. The average minimum and maximum soil temperatures for the period from 8th April to 22nd May were 41° and 63·5° F., respectively, with a mean of 52·6°. Excess moisture and low soil temperatures have been found to coincide with heavy sclerotial infection on the tubers, which was experimentally shown to be increased by copious irrigation in the latter part of the season. Tuber disinfection experiments with various substances showed that mercuric chloride (non-acidulated) 1 in 1,000 [cf. ibid., xiv, pp. 527, 607] gave the best results (7·1 per cent. of tubers infected against 47·0 per cent. in the untreated) and a combination of this treatment with careful regulation of irrigation is recommended against the disease.

ROHDE (G.). **Kali im Stoffwechsel der Pflanzen unter besonderer Berücksichtigung der Kalimangelerscheinungen an Kartoffeln.** [Potash in plant metabolism with special reference to potash deficiency manifestations in Potatoes.]—*Ernähr. Pfl.*, xxxi, 13–14, pp. 237–243, 1 fig., 1935. [English and Spanish summaries on p. 256.]

The writer summarizes the results of his own observations in Germany and those of others on the role of potash in plant metabolism and the effects of its withdrawal, especially on potatoes [*R.A.M.*, ix, p. 741]. The symptoms of potash deficiency include a dull, dark green coloration of the foliage, stunting of the leaves due to crowding of the pinnules, general drooping resultant on disorganization of the water economy, cessation of growth before maturity, downward curling, brown spotting, and shrivelling of the leaves, reduction of flowering, poor root development, low starch content, and inferior keeping quality. Potash starvation is further liable to promote infection by mosaic and other diseases, notably scab [*Actinomyces scabies*], *Rhizoctonia* [*Corticium*] *solani*, blackleg [*Bacillus phytophthorus*], streak, leaf roll, and late blight (*Phytophthora infestans*). Wart disease [*Synchytrium endobioticum*] also seems to be related, at any rate indirectly, to potash, the proportion of which in immune varieties was shown by Finnish researches to be uniformly somewhat higher than that of susceptible sorts (P. Tuorila in *Wiss. Veröff. Finn. MoorKultVer.*, 1912) [cf. also *R.A.M.*, xiii, p. 723].

The following are among the microscopic structural changes commonly found in potash-starved plants: narrow epidermal cells, ill-defined chlorophyll layers, weak collenchymatous tissue, distended spongy outer parenchymatous tissue, looseness of bast tissue, single layers of cambium, and medullary rays, and incompletely developed vascular bundles.

Physiologically, potash-deficient potatoes are characterized by an initial increase followed by a decline in respiration [cf. ibid., xiii, p. 533], a reduction in assimilatory capacity and protein formation, an excess of nitrogen, a retardation of nitrate reduction, reduced enzymatic activity, an abnormally high P_H value of the sap, and low potash content. Cell division is relatively inactive and cell structure imperfect.

CRALLEY (E. M.) & TULLIS (E. C.). **A comparison of Leptosphaeria salvinii and Helminthosporium sigmoideum irregulare.**—*J. agric. Res.*, li, 4, pp. 341–348, 4 figs., 1935.

This is a full account of the authors' studies of a fungus which they found causing a stem rot on rice in Arkansas, Louisiana, and Texas, and which in the 46th Annual Report of the Arkansas Agricultural Experiment Station, pp. 52–53, 1934, they had briefly described as a new variety *irregulare* of *Helminthosporium sigmoideum*. The new variety differs from the type species chiefly in that its sclerotia are irregular in shape and distinctly smaller, measuring only 268 to 342 by 90 to 110 μ, and are usually embedded in the substratum in irregular masses on radiating strands of the hyphae, while those of *H. sigmoideum*, the conidial stage of *Leptosphaeria salvinii* [*R.A.M.*, xiv, p. 119], are spherical or nearly so, and are formed singly and as abundantly by the aerial as by the submerged hyphae. The conidia of *H. sigmoideum* var. *irregulare* are similar in shape and size to those of *H. sigmoideum*, but in pure culture they are not so regularly tri-septate and many of them tend to produce germ-tubes from the apex while still attached to the conidiophore, a phenomenon which was never observed with *H. sigmoideum*. No perithecial stage of *H. sigmoideum* var. *irregulare* has so far been seen, either in nature or in culture, and numerous attempts to induce the fungus to produce sclerotia typical of *L. salvinii* gave negative results.

It is stated that in a Japanese book on crop diseases, published in 1934, Nakata identified as *H. sigmoideum* a fungus from rice with irregular sclerotia, which, from cultures sent by him to the authors, proved to be identical with their *irregulare* variety, while the fungus with spherical sclerotia, which has been shown to be *L. salvinii*, is described by him as *H. sigmoideum* var. *microsphaeroides*; these two designations are reduced to the rank of synonyms. Cultures of *H. sigmoideum* var. *irregulare* were also received and studied by the authors from the Philippine Islands and found to be essentially the same as those from other sources. Sakurai's *Sclerotium* No. 3 is also perhaps identical with it.

The pathogenicity of *H. sigmoideum* var. *irregulare* to rice was conclusively proved by laboratory and greenhouse experiments, the percentage of plants which became infected being 100 and 34·9 respectively.

Fukushi (T.). **Multiplication of virus in its insect vector.**—*Proc. imp. Acad. Japan*, xi, 7, pp. 301–303, 1935.

After demonstrating the transmissibility of the virus of rice dwarf through the eggs of its insect vector, *Nephotettix apicalis* var. *cincticeps* [*R.A.M.*, xiv, p. 468], the writer describes experiments carried out to determine whether it was similarly passed on to the third generation. A leafhopper bred from a viruliferous female and paired with a non-infected male produced infections in 38 plants, and laid 35 eggs, 26 nymphs from which were transferred immediately on hatching to healthy plants. Of these third generation individuals, the 15 surviving for a sufficiently long period proved to be viruliferous. Six were transferred daily to new healthy plants and caused infection in 13, 55, 35, 11, 50, and 28, respectively. Since the amount of virus originally contained in the body of a nymph must be extremely minute, it seems necessary to postulate the multiplication of the infective principle within the insect to explain the widespread dissemination of the disease in the absence of renewed access to a source of infection.

Endô (S.). **Effect of sunlight on the infection of the Rice plant by Hypochnus sasakii Shirai.**—*Bull. Miyazaki Coll. Agric. For.* 8, pp. 75–78, 1935. [Japanese summary.]

In experiments conducted to ascertain the effect of sunlight on the infection of rice by *Hypochnus* [*Corticium*] *sasakii* [*R.A.M.*, xiv, p. 795], fully grown pot plants were inoculated by inserting a sclerotium between the leaf sheath and the culm near the ligule, and exposed to sunlight in the inoculation chamber maintained at 32° C. for 0, 3, 6, and 12 hours, after which they were transferred to a dark chamber kept at the same temperature; 24 hours after inoculation the sclerotia were removed and the plants placed in a greenhouse at 28° to 32°. The results obtained in seven sets of experiments showed that the percentage infection decreased with increased exposure to sunlight, the plants developing 37, 13, 5, and 0 lesions, respectively [cf. ibid., xi, p. 800]. Other tests [the results of which are tabulated] demonstrated that sunlight tended to inhibit both the development of mycelia from the sclerotia and mycelial growth itself. The author concludes that the reduced infection following exposure to sunlight was directly due to the influence of the sunlight on the fungus.

Endô (S.). **Studies on the antagonism of microorganisms. V. Pathogenicity of Hypochnus sasakii Shirai, Hypochnus centrifugus Tul. and Sclerotium oryzae-sativae as influenced by the antagonistic action of the filtrates of certain fungous antagonists.**—*Bull. Miyazaki Coll. Agric. For.* 8, pp. 61–73, 1935. [Japanese summary.]

In these studies filtrates of cultures of *Aspergillus niger*, *A. parasiticus*, and *A. tamarii* grown in Saito's onion decoction for 21 days at 28°, were added to clean sand in Erlenmeyer flasks (50 c.c. filtrate to 100 c.c. sand) and the flasks were inoculated with the rice pathogens *Hypochnus* [*Corticium sasakii*: see preceding and next abstracts], *H. centrifugus* [*C. centrifugum*: see above, p. 24], and *Sclerotium oryzae-sativae* Sawada [*R.A.M.*, xi, p. 801]. After one to three days 40 healthy seeds of

Sinriki rice were sown on the sand in each flask. Measurements of the weights, heights, and length and number of roots of the seedlings showed that the filtrates from the cultures of *A. niger*, *A. parasiticus*, and *A. tamarii* were antagonistic to and weakened the pathogenicity of all three rice organisms; they were, moreover, somewhat toxic to the seedlings themselves.

When seedlings were inoculated at the ligule of the leaf sheath with a sclerotium of *C. sasakii* and the treated portion covered with a piece of cotton moistened either with water only, culture solution only, culture filtrate of *A. niger*, of *A. parasiticus*, or of *A. tamarii*, 41, 44, 23, 18, and 25 plants, respectively, became diseased out of 50 plants for each treatment while the number of lesions formed was 93, 125, 27, 27, and 47, respectively. This result proves that the culture filtrates weakened the pathogenicity of *C. sasakii* on the stems of rice plants, and in this case were not toxic to the host.

Endô (S.). **On the influence of hydrogen-ion concentration on the mycelial growth of the causal fungi of Sclerotium diseases of the Rice plants.**—*Bull. Miyazaki Coll. Agric. For.* 8, pp. 1–11, 1935. [Japanese, with English summary.]

The minimum, maximum, and optimum P_H values for the growth of *Hypochnus* [*Corticium*] *sasakii* [*R.A.M.*, xiv, p. 120 and preceding abstracts] were, respectively, 2·507, 7·759, and from 5·437 to 6·667, for *Sclerotium oryzae-sativae* they were 2·674, 8·262, and between 4·172 and 7·414, for the *Sclerotium* referred to as 'Sakurai's No. 2' [ibid., xi, p. 539] they were 2·672, 8·522, and 5·991 to 6·13, for *S.* 'Sakurai's No. 3' [loc. cit.] they were 3·201, 9·01, and 5·073 to 5·939, for the 'Haiirokinkaku' fungus (*S.* sp.) they were 2·699, 8·73, and 5·506 to 5·749, and for *S. japonicum* Endô & Hidaka 2·699, 9·01, and 5·004 to 6·165.

Murray (R. K. S.). **Oidium leaf disease in Ceylon in 1935.**—*Quart. Circ. Rubb. Res. Scheme*, xii, 1–2, pp. 1–9, 1935.

During 1935, when the season was abnormally dry, *Oidium* leaf disease of *Hevea* rubber [*O. heveae*: *R.A.M.*, xiv, p. 654] was very severe in Ceylon at high altitudes as well as in those mid-country areas where the trees wintered late; in both localities there is urgent need for sulphur dusting to be continued. In the low-lying districts the incidence of the disease, slight at first, rose rapidly with the advent of the rains in mid-February, and late-wintering trees suffered seriously; in these areas the disease is likely to remain of considerable consequence.

Experimental areas dusted and manured, dusted only, manured only, and untreated showed, respectively, 88, 92, 19, and 35 per cent. of the trees with healthy leaves and 1, 1, 34, and 24 per cent., respectively, of the trees appreciably defoliated, the remainder having leaves spotted and malformed. The cost of the dusting (machines not included) was 3·54 rupees [5*s.* 3*d.*] per acre. The largeness of the leaves on the dusted trees and their almost complete freedom from spotting and distortion showed conclusively that the reduction of leaf area caused by *O. heveae* has hitherto been altogether underestimated.

As severely affected areas show great reduction of seed, and as the

pods act as the chief centres of infection by the *Phytophthora* [*P. palmivora*: ibid., xiii, p. 593], causing secondary leaf fall, the greater the incidence of *O. heveae* the less the likelihood of later infection by *P. palmivora*, and vice versa. On some low-country estates the control of *O. heveae* was so complete in 1935 that there was a sharp attack by *P. palmivora* in June and early July. Observations on the effect of the *Phytophthora* in dusted areas indicated that the advisability of dusting the areas more lightly affected by mildew is open to question, but in wet low-country areas, while dusting need not be discontinued, the safest course is to compromise, allowing *O. heveae* to attack the flowers, but preventing most of the foliage injury. The author suggests that for these areas, but not at high elevations or in districts where a wet monsoon is not experienced, the quantity of sulphur used should be reduced by a third, to about 4 lb. per acre per application.

MURRAY (R. K. S.). **The control of Oidium.**—*Quart. Circ. Rubb. Res. Scheme*, xii, 1–2, pp. 10–17, 1935.

In this lecture given to the Matale Planters' Association on 17th April, 1935, the author, discussing the conclusions to be drawn from the season's sulphur dusting of *Hevea* rubber against *Oidium* [*heveae*: see preceding abstract] in Ceylon, states that in the absence of control there is little likelihood that the disease will revert to its former unimportance. The improvement in foliage resulting from an expenditure of 4 or 5 rupees [about 6*s*.] per acre on dusting was much greater than that given by one of 30 rupees [45*s*.] per acre on manuring. At all elevations from sea-level to 2,000 ft. dusting gave very striking control. Emphasis is laid on the urgent importance of making the first application sufficiently early and the subsequent ones at approximately weekly intervals. The quantity of sulphur required ranges from 25 lb. per acre per season in the low country to 75 lb. at high elevations. The cost of the treatment (including all charges except depreciation of the machine) varied from 3 to 9 rupees per acre. Supposing that one machine suffices for 500 acres and that its cost is written off in three years, 80 cents per acre per annum must be added to the cost of treatment, which, on a basis of a crop of 250 lb. per acre means that dusting increases the cost of production by 2 cents [a little over ½*d*.] per lb. The risk of the dusting causing serious tainting of adjacent tea bushes [*R.A.M.*, xiv, p. 657] can be obviated with reasonable care, and if necessary by arranging for the dusting to be carried out immediately after the plucking of the tea.

PIERIS (W. I.). **Demonstration of the control of Oidium on smallholdings in 1935.**—*Quart. Circ. Rubb. Res. Scheme*, xii, 1–2, pp. 18–24, 1935.

The beneficial effect of sulphur dusting against *Oidium* [*heveae*] on *Hevea* rubber [see preceding abstracts] was demonstrated to smallholders on plots in each of five centres in Ceylon in 1935, the treated trees, in contrast to the neighbouring untreated ones, showing an absence of leaf fall, spotting, distortion, and discoloration, a glossier foliage of a richer green, and an abundance of flower. The total cost amounted to approximately 8·5 rupees [12*s*. 9*d*.] per acre, this high

figure being due to the heavy labour costs of the experiments and the numerous dustings necessitated by uneven wintering.

Cutler (D. W.) & Crump (Lettice M.). **Problems in soil microbiology.**—vii+104 pp., 1 fig., 1 diag., 16 graphs, 1 map, London, Longmans, Green & Co., 1935.

The contents of this monograph are stated to be largely based on work carried out in the General Microbiology Department of the Rothamsted Experimental Station by the authors and their colleagues. Throughout the book an attempt is made to show that, biologically speaking, the soil is an eminently suitable home for living organisms and that, in course of ages, a population has been selected that is, on the whole, so unspecialized as to permit the inclusion within the general soil economy of almost any substance introduced either naturally or in the incidence of modern agricultural practice. The activities of each micro-organism depend on those of its fellows, and the courses of their combined lives form a highly complex problem which can only be solved by a study of the interactions between the individual components. The outcome of some steps in this direction is here summarized.

Verona (O.). **Di due nuove specie di Torulopsis a pigmento rosso isolate dal terreno.** [On two new species of *Torulopsis* with red pigment isolated from the soil.]—*Arch. Protistenk.*, lxxxv, 2, pp. 312–318, 6 figs., 1935.

Full cultural, morphological, and physiological details are given of two new species of *Torulopsis* with red pigment [*R.A.M.*, xiv, p. 193] isolated from soil, one (*T. terrestris*) from the Volterrana district of Pisa and the other (*T. somala*) from Somaliland. The former is characterized on bean agar by isolated spherical or oval cells, 4·9 to 6·6 by 3·3 to 6·6 μ; on potato the corresponding measurements are 7 to 8·2 μ and on carrot 6·6 by 4·9 or 7 to 8·2 μ. On the first-named medium the colonies are pink, opaque, and slightly raised. Gelatine is not liquefied or milk coagulated, nitrates are not reduced or indol formed; sugars are not fermented but saccharose and maltose are inverted. Protein, asparagin, ammonium sulphate, and potassium nitrate are good sources of nitrogen. The dimensions of *T. somala* on bean agar are 8·2 to 9·9 by 2·5 to 3·3 μ, on potato 11·5 by 8·2 μ, and on carrot 8·2 by 6·6 μ. The colonies are of a vivid pink colour on bean agar. The biochemical characters of *T. somala* are generally similar to those of *T. terrestris*; acid is formed in abundance from levulose, mannose, and saccharose.

Cook (M. T.). **Root diseases of Sugar Cane in Puerto Rico. Part I. Normal structure of roots. Part II. A new parasitic fungus in the roots of Sugar Cane.**—*J. Agric. Univ. P.R.*, xix, 2, pp. 121–128, 8 pl., 1935.

After describing the normal structure of healthy sugar-cane roots, the author gives a brief account of a new parasitic fungus observed in stained sections of sugar-cane roots made from pot plants under study for another disease. A search for living material was unsuccessful.

The only outwardly visible symptom was small, reddish spots. The fungus, which was confined to the younger parts of the roots, was

present in the epidermal cells and cortex, but not in the axis-cylinder. There was no enlargement of the host cells, which were almost completely filled by a single plasmodial mass, or, occasionally, by several such masses. The plasmodium developed into either a thick-walled resting sporangium without a germ-tube but containing many spores, or into a thin-walled sporangium producing a single germ-tube, which punctured the cell walls and penetrated one to four cells, possibly more, and sometimes passed through the epidermis; branching of the germ-tube was observed only once. The spores formed were apparently emptied into the soil or another cell, those that passed into the soil presumably penetrating the epidermal cells of the same or another root. Many cases were observed of the infection of the epidermal cells.

As the life-history of the fungus was practically the same as that of *Olpidium*, except that flagella (which may have been present on living material) were not found on the spores, the author tentatively places the fungus in this genus, naming it [with a Latin diagnosis] *O. sacchari* n.sp. The sporangia measured 2·6 to 3·5 μ in diameter.

Wolcott (G. N.). **The first records of the mosaic disease of Sugar-Cane in Puerto Rico.**—*J. Agric. Univ. P.R.*, xix, 2, pp. 117–120, 1 map, 1935.

The author presents data concerning early records of mosaic disease of sugar-cane in Porto Rico [*R.A.M.*, vi, p. 581; xii, p. 327; xiii, p. 58; xiv, p. 607] obtained during his study of the insect pests of the crop. His field-notes indicated that on 26th March, 1915, a disease which he now believes was mosaic, was present at Añasco, Tahlon Pahlo, and at Colonia Pacha; while on 6th April, 1915, it occurred at Colonia Carlo Bravo. In 1916 the writer recorded it at Quebradillas, Camuy, and Aguadilla, and at three places in Filial Amar; these records show that in 1916 the disease must have existed far south of the area mapped by Stevenson (*J. Dep. Agric. P.R.*, iii, 3, 1919) and that the original focus of infection may have been, not in the hills behind Camuy, but much farther south.

Brandes (E. W.) & Matz (J.). **Recovery of the Sugar Cane plant from the mosaic disease.**—Abs. in *Facts ab. Sugar*, xxx, 11, p. 425, 1935.

In a paper presented to the Fifth Congress of the International Association of Sugar Cane Technologists by the above-mentioned writers, it is stated that a reduction in the infection of sugar-cane by mosaic has been effected in experiments by the admixture of juice from healthy tissues near the tip of the cane stalk with the virus inoculum taken from various diseased portions. The results indicate that a protective substance is generated near the tip of the stalk and that there are variations in the virulence of the virus taken from different parts of the cane.

The performance of some of the plants arising from the eyes of formerly diseased stalks suggests that mosaic may in some way be overcome. Different eyes from diseased stalks may produce either healthy or mosaic plants, and cases of apparently permanent mass recovery have been observed where an entire field was infected. The best method of mosaic control is the use of resistant varieties. Seed

selection from healthy stools, supplemented by roguing, is reliable only in regions where insect spread of the disease is rare.

There are stated to be indications that virus diseases are not as new as generally supposed, mosaic and Fiji [*R.A.M.*, xiv, p. 333], for instance, having been found in New Guinea, where sugar-cane was grown for many years without the importation of any new material likely to introduce infection.

Unamuno (L. M.). **Reliquiae Fragosoanae.** [Material left by Fragoso.] —*Bol. Soc. esp. Hist. nat.*, xxxv, 7, pp. 395–402, 1 fig., 1935.

A Latin diagnosis is given of *Septoria mexicana* G. Fragoso & L. Herrera sp. nov. ad int., forming numerous scattered, often confluent, irregular spots, 1 to 3 mm. in diameter, dark-coloured to black on the upper side, ashen-grey on the under, with a darker halo, on living leaves of willow (*Salix* sp.) from Mexico. The light brown, globose or globose-conoid pycnidia measure 70 to 107·5 μ in diameter and the hyaline, straight, flexuous, curved, or arcuate, subclaviform, uni-, rarely bi-septate, pluriguttulate pycnospores 34·5 to 88 by 4·2 to 5 μ. Brief taxonomic notes are given on ten other species of *Septoria* on willow with which the new one was compared.

Grove (W. B.). **British stem- and leaf-fungi (Coelomycetes).**—xviii+488 pp., 31 figs., Cambridge University Press, 1935.

This is the first of two volumes dealing with the British Sphaeropsidales and Melanconiales; the work, when completed, will represent the first comprehensive account that has been attempted since Cooke's Handbook of British Fungi (1871). Cooke enumerated about 200 species; the present account will include more than 2,000. Volume I includes the Hyalosporae, Hyalodidymae, Hyalophragmiae, and Scolecosporae sections of the Sphaerioideae. The account is morphological, as cultural and pathological studies are excluded. It is based on Volume III of Saccardo's Sylloge with further consideration of the standard floras by Allescher, Diedicke, and Migula together with Traverso's Pyrenomycetae volume of Flora Italica Cryptogama. All the species described have been seen and microscopically examined unless the contrary is stated; the material studied is that preserved at Kew, the British Museum, and, for more than 3,000 specimens, in the author's herbarium. The work consists of generic keys and descriptions, and descriptions of the species in English. In such genera as *Cytospora*, *Phomopsis*, and *Septoria* 'the list of presumed species cannot be considered as anything but an interim catalogue of the known and described forms'. From field evidence, however, the author believes 'that two allied fungi growing upon two different hosts may themselves be equally different. Therefore, generally, in these pages the host will be made the supreme test.'

In the larger genera, the species are arranged on the basis of the host genera in alphabetical order, but sometimes with modifications; plurivorous species always come first; related hosts are, when convenient, kept together under their family or ordinal name as Gramineae, Coniferae. The systematic account closes with the Latin diagnosis of

24 new species, and the volume with a host index and an index of binomial names.

The whole represents a straightforward and valuable account of these difficult fungi, written in the main from the standpoint of an enthusiastic collector.

TEHON (L. R.). **A monographic rearrangement of Lophodermium.**—*Illinois biol. Monogr.*, xiii, 4, 151 pp., 5 pl., 1935.

The author has made a critical revision of the genus *Lophodermium* [*R.A.M.*, xii, p. 254] from a purely taxonomic standpoint, on the basis of which he here recognizes, with copious annotations, keys, and general explanatory observations, 25 good species (including four new, one new combination, and one new name). A new genus of the Hypodermataceae, *Dermascia*, represented by the type species *D. alpina* (Rehm) n.comb. and 13 others (one new), is created for those species differing from *Lophodermium* Chevallier in their intra-epidermal hysterothecia and from *Lophodermellina* Hoehn. and *Lophodermina* Hoehn. in the absence of a chitinized, aliform plate to the hysterothecia. The two latter genera, both published by von Höhnel without descriptions (*Ber. dtsch. bot. Ges.*, xxxv, pp. 418–419, 1917), are supplied with diagnoses; the former with intra-epidermal hysterothecia comprises nine species (one new and five new combinations), and the latter, with subcuticular hysterothecia, 24 species (two new and 20 new combinations). Finally, a list is given of 18 excluded species and of four that could not be classified in any of the above-mentioned genera, namely, *Bifusella vaccinii* (Carm.) n.comb., *Epidermella* n.g. with *E. communis* (Fr.) n.comb. and *E. laurii* (Fr.) n.comb., and *Locelliderma* n.g. with *L. ampelodesmi* (Ces.) n.comb.

A six-page bibliography and host and fungus indexes are appended.

BRUNDZA (K.). **Indėlis Lietuvos Erysiphaceju florai.** [Contributions to the knowledge of Lithuanian Erysiphaceae.]—Reprinted from *Ž. Ū. Akad. Metraščio, Kovno, 1935*, 17 pp., 1935. [German summary.]

Continuing his studies on Lithuanian Erysiphaceae [*R.A.M.*, xiii, p. 805], the author states that the total number of species recorded for the country is 58; of the 84 plants here listed in an alphabetical index, 36 are new hosts for the powdery mildews, the prevalence of which was greatly increased by the dry weather of 1934. The perithecial dimensions of *Erysiphe cichoracearum* on opium poppy (*Papaver somniferum*) [ibid., v, p. 175] are larger (95 to 151 μ, average 120·4 μ) than those given by Jaczewski (90 to 125 μ) in his key for the determination of the powdery mildews [ibid., vii, p. 346]. Parsnips were infected by *E. umbelliferarum* [*E. polygoni* sensu Salmon] and cabbage by the *Oidium* stage of *E. communis* [*E. polygoni* sensu Salmon: ibid., x, p. 362]. The author points out that the *Pseudoidium* section of *Oidium* is characterized by short intervals between the conidiophores (48 μ) and the narrow width of the foot cell of these organs (average 6·3 μ) as compared with the corresponding dimensions in *Euoidium* (94 and 9·4 μ, respectively).

DOMINIK (T.). **Nowe gatunki grzybków mikroskopowych zachodniej Polski.** [New species of micromycetes from western Poland.]—*Acta Soc. Bot. Polon.*, xi, 2, pp. 239–246, 4 figs., 1934. [Received August, 1935.]

Brief Polish descriptions and Latin diagnoses are given of seven species and one variety of parasitic and saprophytic fungi considered to be new to science, which have been recently recorded from western Poland, including *Leptosphaeria trifolii alpestris* n.sp. which, on the living leaves of *Trifolium alpestre*, forms dark brown, globose perithecia about 200 μ in diameter; the asci are clavate, slightly rounded at the apex, with a short pedicel, and 45 to 60 by 10 to 12 μ; the paraphyses are filiform; the ascospores (8 per ascus) are monostichous, hyaline or faintly olivaceous, slightly curved, 3- to 4-septate, and measure 18 to 21 by 4 to 5 μ. *Ascochyta trifolii alpestris* n.sp. occurs on the leaves of the same host in association with the preceding, causing rounded or irregular, white or faintly greyish-yellow spots with a narrow brown margin, about 0·5 to 1 mm. in diameter; the pycnidia are epiphyllous, slightly depressed-globose, brown, and about 180 by 120 μ; the pycnospores are fusiform, pointed at both ends, uniseptate, hyaline, straight, and 9 to 15 by 2 to 3 μ. It stands closest to *A. trifolii* [*R.A.M.*, xi, p. 654] which differs from it, however, in the larger size and rounded apices of its spores, while *A. medicaginis* [loc. cit.] differs in its larger and slightly curved spores. *Septoria wodziczkiana* n.sp. causes spots on the leaves of *Anemone nemorosa*, *Phoma bacillospora* n.sp. occurs on living branches of *Symphoricarpos racemosus* in association with *Hendersonia fiedleri* var. *symphoricarpi* Cooke, and *Volutella fusariispora* n.sp. on living leaves of *Convallaria majalis* on spots with *Puccinia smilacearum-digraphidis* Kleb.

GUTNER (L. S.). Материалы к монографии рода **Cytospora.** [Contribution to a monograph of the genus *Cytospora*.]—*Acta Inst. bot. Acad. Sci. URSS*, Ser. II (*Plantae Cryptogamae*) *1935*, 2, pp. 411–484, 66 figs., 1935. [German summary.]

This paper represents an attempt at a critical revision of the genus *Cytospora*, undertaken partly because of the considerable confusion which exists in the genus, and partly on account of the apparently increasing economic importance of certain of its species. The author, who chiefly used material from various herbaria, divides the genus into two subgenera, namely, *Eucytospora* (with a perfect stage belonging to the subgenus *Euvalsa* of the genus *Valsa*), and *Leucocytospora* (with perfect stages referable either to *Leucostoma* [cf. *R.A.M.*, xi, p. 60] or *Valsella*), differing from the former in that its stroma is separated from the substratum by a basal layer [black line]. Brief Russian descriptions [with Latin diagnoses for the new species] are given of 50 species of *Eucytospora*, including *C. cupressi* n.sp. ad interim on *Cupressus* spp. in the Crimea, *C. australiae* var. *foliorum* n.var. on the leaves of *Eucalyptus* sp. in the Caucasus, and *C. szembelii* n.sp. on branches of *Populus alba* in the Lower Volga basin; and of 14 species of *Leucocytospora*, including *C. sydowii* n.sp. on the branches of *Prunus* spp. in the Ukraine, differing from *C. leucostoma* and *C. prunorum* in the shape of the pustule and in

the presence of a greyish disk emerging from cracks in the bark of the host. An annotated list is further given of 33 species of *Cytospora* which were not examined by the author, and of species transferred to other genera, including *Cytophoma pulchella* n.comb. for *Cytospora pulchella* Sacc. on branches of *Fraxinus* spp., *Cytophoma syringae* n.comb. for *Cytospora syringae* Sacc. on lilac branches, and *Cytonaema thujae* n.comb. for *Cytospora thujae* Sacc. & Ell. on *Thuja orientalis*. *C. mira*, which was described in 1926 by Tschernetzkaya on dead branches of *Wistaria chinensis*, is referred to a new genus *Fusicytospora* which is created for it, under the name *F. mira*; this genus differs from *Cytospora* in its small, hyaline, continuous, and fusiform spores, measuring up to 10 by 3 μ in diameter. The paper terminates with a list of 31 species which the author considers should be discarded, and indexes of the hosts and the fungi studied.

Bondartzeff (A. S.). Трутовые грибы—**Polyporaceae** Европейской части Союза и Кавказа. [The Polyporaceae of the European part of the Soviet Union and of the Caucasus.]—*Acta Inst. bot. Acad. Sci. URRS*, Ser. II (*Plantae Cryptogamae*) *1935*, 2, pp. 485–532, 17 figs., 1935. [German summary.]

In this paper, which is stated to be the first of a forthcoming series dealing with Polyporaceae occurring in European Russia and the Caucasus, the author gives copious notes (including morphological details) on 20 species of *Fomes* and 4 of *Ganoderma*, as well as on numerous biological forms of these species which he differentiated in the course of his investigations. Russian and Latin diagnoses are given of a new species of *Fomes*, which was found on *Lonicera tatarica* in Siberia, Russian Central Asia, and the Middle Volga basin, and is named *F. lonicerinus*; it is characterized by hoof-shaped, greyish-black or black brackets with rounded or angular reddish to greyish-brown pores. The spores are broadly ellipsoid, 3·5 to 4·5 by 3 to 3·5 μ, and the flask-shaped or conical setae 20 to 35 by 6 to 10 μ in diameter. *F. lonicerinus* agrees closely with *F. ribis* forma *lonicerae* (B. & G.), but differs from the latter in that it has setae.

The paper is supplied with identification keys and is illustrated by drawings of the spores of a number of the species; notes are also given on five doubtful species belonging to these two genera.

Naoumoff (N. A.). Определитель Мукоровых. [Keys for the determination of the Mucorales.]—140 pp., 49 figs., 1 diag., Издат. Акад. Наук СССР. [Publ. Off. Acad. Sci. U.S.S.R.], Moscow, 1935. [French summary.]

This monograph consists of a series of dichotomous keys for the determination of 337 species (including 13 new ones established by the author up to 1933) belonging to 38 genera (one new) of the Mucorales, based either on the author's studies of the organisms in pure culture or on the original descriptions of the species, where cultural material was not available. Somewhat detailed technical descriptions are given of those species and genera presenting difficulties in determination. A new feature is the division of the genera *Mucor*, *Rhizopus*, and *Mortierella* into 13, 3, and 4 sections, respectively, for which new names are sug-

gested. A full alphabetical list of all the species and their synonyms is appended at the end of the book.

HIRATSUKA (N.) & HASIOKA (Y.). **Uredinales collected in Formosa. IV.**—*Bot. Mag., Tokyo*, xlix, 584, pp. 520–524, 1935.

A list is given of 20 Uredinales recently collected in Formosa [cf. *R.A.M.*, xii, p. 726; xiv, p. 719] and of additional hosts for five species already recorded. *Hamaspora benguetensis* Syd. (new to Japan) was found on *Rubus pectinellus* var. *triloba* and *H. hashiokai* n.sp. on *R. lambertianus* subsp. *xanthoneurus*. The latter species [which is furnished with a Latin diagnosis] closely resembles *H. longissima* (Thüm.) Körn, especially in the teleuto stage; it is characterized by spherical, yellow to cinnamon-coloured uredosori, 0·3 to 0·6 mm. in diameter, obovate, ellipsoidal, or oblong, aculeate-echinulate uredospores, 30 to 40 by 18 to 25 μ, densely clustered, caespitose, filiform, ochraceous teleutosori, up to 3 mm. in length, cylindrical, bi- to tri-septate, smooth, hyaline or subhyaline teleutospores, 80 to 110 by 15 to 18 μ, with a long, hyaline pedicel, 12 to 18 μ in thickness. *Juniperus formosana* Hyata was observed to be infected by *Gymnosporangium corniforme* Saw., *Nephrolepis cordifolia* Pesh. by *Milesina philippensis* Syd., and loquats by *Coleopuccinia simplex* Diet. A new host of *Puccinia allii* [ibid., xiv, p. 735] was found in *Allium scorodoprasum* L. var. *viviparum* Rgl.

ITO (S.) & TOKUNAGA (Y.). **Notae mycologicae Asiae Orientalis I.** [Mycological notes from Eastern Asia. I.]—*Trans. Sapporo nat. Hist. Soc.*, xiv, 1, pp. 11–33, 1935.

Latin diagnoses are given of 55 species of fungi which are either new to science or have hitherto been described only in Japanese. *Pythium diclinum* Tokunaga n.sp. (*P. gracile* Schenk. var. *b.* Butler) [*R.A.M.*, x, p. 591] on rice seedlings in Hokkaido is characterized by hyaline, profusely branched hyphae, 1 to 5 μ in diameter; filiform sporangia; spherical vesicles, 18 to 40 μ in diameter, giving rise to up to 50 reniform (globose when at rest), biciliate zoospores, 7·2 to 9·6 μ in diameter; terminal or intercalary, sphaeroidal, smooth oogonia, sometimes furnished with a sharp point near the apex, 18 to 25·2 μ in diameter; one to three, mostly two, diclinous, ovoid or clavate, often curved antheridia, 6 to 12 by 3·6 to 7·2 μ, with a very slender fertilization-tube about 1 μ in diameter; and solitary, spherical or broadly ellipsoid oospores, 14·4 to 22·8 μ.

P. iwayamai S. Ito n.sp. (*P.* sp. Iwayama), a parasite of barley, wheat, and other Gramineae in Honshu, has hyaline or olive-yellow, copiously branched hyphae, 2·9 to 8·9 μ in diameter, usually 6·6 μ; terminal, spherical or irregular, smooth, pale olivaceous to yellowish sporangia 28 to 48 by 44 μ, germinating by lateral hyphae or 8 to 12 zoospores, spherical when at rest, 9 to 15 μ in diameter; intercalary, ellipsoid, pale olivaceous chlamydospores, 36 to 48 by 24 μ, androgynous or diclinous, clavate antheridia, usually occurring singly, sometimes in pairs; and spherical, olivaceous to yellow, smooth oospores, 19 to 24 μ in diameter.

Phytophthora citricola Saw. nom-seminud. [ibid., vii, p. 273; x, p. 755], forming circular spots spreading over the entire surface of orange

(*Citrus sinensis* Obs. f. *sekkan* Hayota and *C. tankan* Hyata) fruits in Formosa, is characterized by hyphae 4 to 10 μ in diameter; simple or branched conidiophores; ovoid or obclavate, papillate sporangia, 21 to 70 by 15 to 39 μ germinating by ovoid, biciliate zoospores, 13 to 8 to 9 μ, or rarely by a germ-tube; spherical, hyaline or brown oogonia, 21 to 44 μ in diameter; obovoid, paragynous or very rarely amphigynous antheridia, 12 to 13 by 8 to 10 μ; and spherical, hyaline or yellow oospores, 18 to 38 μ in diameter.

P. fagopyri Takimoto nom. seminud., producing dark brown spots on buckwheat stems in Kyushu and Korea, has hyphae, 4 to 12 μ in diameter; globose, ellipsoid or oblong-ovoid, distinctly papillate, sporangia, 35 to 45 by 24 to 35 μ, germinating by a germ-tube; hyaline, later yellowish-brown chlamydospores, 40 to 50 by 40 to 46 μ; and diclinous, paragynous, clavate antheridia. [Oospores are not mentioned in this diagnosis.]

The inter- or intra-cellular hyphae of *P. boehmeriae* Sawada nom. seminud. [loc. cit.], occurring on *Boehmeria nivea* leaves in Formosa, measure 4 to 8 μ in diameter and are furnished with haustoria; the unbranched conidia are extremely slender (15 to 16 by 2 to 3·5 μ); the ovoid to globose or oblong-ovoid, papillate, pedicellate sporangia measure 27 to 72 by 20 to 46 μ and germinate by zoospores; the spherical, hyaline or brown oogonia are 21 to 41 μ in diameter; the diclinous, amphigynous, spherical, or obovoid antheridia measure 12 to 16 by 11 to 15 μ; and the spherical, hyaline oospores, germinating by a germ-tube, are 17 to 35 μ in diameter.

P. tabaci Sawada nom. seminud. [loc. cit.] forms round, olive to brown spots on tobacco leaves and stems in Honshu. Its intercellular hyphae are 7 to 8 μ in diameter and provided with cylindrical haustoria; the ovoid, ellipsoid, or globose to ovoid, papillate sporangia measure 16 to 58 by 12 to 45 μ or up to 74 by 64 μ, and germinate by ovoid, laterally biciliate zoospores, 13 to 8 to 9 μ; the yellow to brown, spherical chlamydospores are 21 to 55 μ in diameter; the oogonia are spherical, hyaline, and 26 to 30 or rarely up to 43 μ in diameter; the amphigynous, obovoid, or spherical antheridia measure 14 to 18 by 11 to 18 μ; and the spherical, hyaline oospores are 21 to 24 or rarely 30 μ in diameter. This species is considered to be closely related to *P. parasitica* Dastur [ibid., x, p. 754], of which it may in fact be merely a biologic form [*P. parasitica* var. *nicotianae*].

P. canavaliae Hara nom. seminud. forms dark brown spots on the leaves, stems, and fruits of *Canavalia ensiformis* in Honshu. Its intercellular hyphae measure 3 to 8·8 μ in diameter and are provided with cylindrical or globose haustoria; the single or aggregated, simple or branched conidiophores measure 5 to 35 by 2·2 to 4·4 μ; the sporangia are of variable shape, mostly 55 by 25 μ, and germinate by ellipsoid, biciliate zoospores, 10 to 12 by 7 to 9 μ, or more rarely by a germ-tube; sexual reproductive organs were not observed.

Couch (J. N.). **Septobasidium in the United States.**—*J. Elisha Mitchell sci. Soc.*, li, 1, pp. 1–77, 44 pl., 1935.

A copiously annotated list is given of 36 species of *Septobasidium* found in the United States, of which *S. curtisii* [*R.A.M.*, x, p. 557] is

stated to be the most common, occurring on *Nyssa sylvatica*, ash (*Fraxinus americana*), and 26 other hosts. Next in order of frequency is *S. pseudopedicellatum* [ibid., xiii, p. 540], observed on ash, *Carpinus caroliniana*, and 21 other kinds of trees, followed by *S. sinuosum* and *S. castaneum* with 15 and 14 hosts, respectively. The total number of trees found subject to attack by *S.* spp. in the regions visited by the writer (chiefly in the southern States) was 76, insects belonging to 19 species being associated with the fungus species.

All the United States species of *Septobasidium*, with two exceptions, form basidia of eight different types, the distinguishing features of which are indicated. The life-history and morphology of the genus, as represented by nine species studied in detail, is concisely outlined. The damage caused to trees by the combination of fungus and insect may be considerable, young ash and *N. sylvatica*, for instance, sometimes being killed by *S. pseudopedicellatum* and *S. curtisii* and their symbionts, while larger trees assume an unhealthy appearance with many dead limbs. The 18 new species and one new variety described in this paper are furnished with English diagnoses and a key to the species occurring in the United States is given.

MULLER (A. S.) & CHUPP (C.). **Cercosporae de Minas Geraes.** [*Cercosporae* from Minas Geraes.]—*Arq. Inst. Biol. veg.*, i, 3, pp. 213–220, 1935. [English summary.]

An annotated list is given of 71 species of *Cercospora* collected by the writers in Minas Geraes, Brazil, during the past few years; the ten new species are furnished with diagnoses in Portuguese. *C. anacardii* n.sp. forms irregular, dark red lesions, 1 to 4 mm. in diameter, on the upper side of *Anacardium occidentale* and *Anona reticulata* leaves. It is characterized by fasciculate, septate, occasionally geniculate, sometimes branched conidiophores, 40 to 125 by 4 to 5 μ, bearing obclavate, usually straight, olivaceous conidia, 50 to 125 by 3 to 4 μ. *C. anonae* causes on leaves of *A. squamosa* numerous angular spots, 0·5 to 1·5 mm. in diameter, sometimes surrounded by a yellow or dark-coloured border; the densely fasciculate, non- or uni-septate, rarely branched, pale olivaceous conidiophores, 20 to 75 by 3·5 to 4·5 μ, bear mostly obclavate, pluriseptate conidia of a darker olive than the conidiophores, generally truncate at the base, tapering towards the apex (half the width of the base), 75 to 150 by 5 to 6 μ.

The genus *Ragnhildiana* Stevens & Solheim [*R.A.M.*, xi, p. 129] is rejected on the grounds that the conidial catenulation on which the genus is based is a very common and purely evanescent character, unsuitable as a taxonomic criterion; the fungus *R. manihotis* is transferred to *Cercospora* and renamed *C. caribaea* Ciferri. *C. henningsii* is also recorded on cassava. *C. vicosae* n.sp. on leaves of *Manihot* sp. is characterized by fasciculate, coremioid, geniculate, olivaceous conidiophores, 50 to 150 by 4 to 6 μ, and obclavate, olivaceous conidia, 25 to 100 by 4 to 6 μ, both conidiophores and conidia having shining septa.

Rose leaves bear on the upper side white, purple-bordered spots, 0·5 to 2 mm. in diameter, caused by *C. hyalina* n.sp., the fasciculate, non- to uni-septate, indistinctly geniculate, olive-yellow conidiophores of which, 30 to 100 by 4 to 5 μ, bear obclavate, straight or curved,

indistinctly septate conidia, slightly obtuse or truncate at the base, tapering towards the apex, 40 to 150 by 2 to 3 μ, the site of insertion on the conidiophores being marked by a scar. This host was also infected by *C. rosaecola* [ibid., xi, p. 516].

The following are among the many other records of phytopathological interest: *C. canescens* [ibid., xi, pp. 130, 431] and *C. columnae* on bean (*Phaseolus vulgaris*), *C. capsici* and *C. rigospora* on chilli (*Capsicum frutescens*) [ibid., xi, p. 605 *et passim*], *C. citrullina* on watermelon [ibid., x, p. 771], *C. cordobensis* on sweet potato, *C. oryzae* on rice, *C. solanicola* on potato, and *C. longipes* on sugar-cane [ibid., xii, pp. 39, 467].

Schmidt (M.). **Untersuchungen über das Verhalten von Tabaksorten und Nicotianaarten gegen den Erreger des 'Wildfeuers', Pseudomonas tabaci, mit Berücksichtigung züchterischer Fragen.** [Studies on the reaction of Tobacco varieties and *Nicotiana* species to the agent of 'wildfire', *Pseudomonas tabaci*, with reference to breeding problems.]—*Züchter*, vii, 3, pp. 208–215, 5 figs., 1935.

The outstanding results of inoculation experiments at the Kaiser Wilhelm Genetic Research Institute, Müncheberg, Mark Brandenburg, on 102 varieties, strains, and types of *Nicotiana tabacum* and a number of other *N.* species with *Pseudomonas* [*Bacterium*] *tabacum* have already been noticed from another source [*R.A.M.*, xiv, p. 61]. In the present expanded account the following additional information is of interest. Although every form of *N. tabacum* was more or less susceptible to wildfire there were considerable variations in the degree of involvement. A Turkish cigarette tobacco, for instance, as well as others showed marked susceptibility in the inoculation tests, and also contracted infection in the open in 1933, an exceptionally unfavourable season for the pathogen in Germany. Slight susceptibility, on the other hand, was manifested under controlled conditions by a strain of *N. tabacum* var. *macrophylla* and two local German varieties from Oderbruch and the Palatinate, the reaction being of the aberrant type [loc. cit.].

Hackbarth and v. Sengbusch have shown (*Züchter*, vii, 1, 1935) that the *petunioides* section of *Nicotiana*, to which the resistant species mainly belong, is practically devoid of nicotine, but no absolute correlation could be traced between this property and resistance to wildfire, which virulently attacked certain types with a low nicotine content, e.g., *N. silvestris* and a v. Sengbusch Havana selection 4132.

In further mass inoculation experiments by Stapp's method [*R.A.M.*, xii, p. 600], a Palatinate strain of *N. tabacum* behaved differently from the other strains in that while 294 out of 298 plants contracted virulent infection, none died. Besides *N. affinis*, *N. micrantha* displayed considerable resistance in the mass-inoculation trials, but even *N. affinis* seedlings, when inoculated at the critical stage of development, i.e., a week earlier than the comparable phase in *N. tabacum*, succumbed to infection.

The work on crossing of superior tobaccos with resistant species of *Nicotiana* and the selection of resistant hybrids approximating to the *tabacum* type presents great difficulties, since the absence of resistance within the *tabacum* section necessitates the use as parents of forms

only very distantly related either to *N. tabacum* or *N. rustica* in their chromosome numbers and chemical attributes. Alternatively, it might be feasible to develop a degree of resistance adequate for field conditions by selection and hybridization of resistant individuals.

Grooshevoy (S. E.). **Combating bacterial rust on Tobacco.**—*Табач. Пром.* [Tobacco Ind.] *1935*, 1, pp. 27–29, 1935. [Abs. in *Chem. Abstr.*, xxix, 18, p. 6354, 1935.]

For the control of bacterial rust of tobacco [*Bacterium tabacum*: *R.A.M.*, xiv, p. 659] in the U.S.S.R. the soil in infected seed beds should be steam-sterilized or heated directly at not less than 100° C., the seed treated by immersion for 15 minutes in a 0·1 per cent. solution of silver nitrate [ibid., xi, p. 77] in distilled water or in a formalin solution, 1 part (commercial) in 16, followed by washing in water, and the wooden parts of hot-beds and tools disinfected with a 1 in 25 formalin solution [see next abstract]. The young plants should be given a series of protective applications of Bordeaux mixture, beginning at 0·5 and continuing with a 1 per cent. solution, while those actually attacked by the disease must be destroyed by treatment with a 3 per cent. Bordeaux solution. Healthy young plants from infected batches should be sprayed with 1 per cent. Bordeaux mixture on transplanting.

Böning (K.). **Versuche zur Bekämpfung von Keimlingskrankheiten und Wurzelbrand des Tabaks in den Anzuchtbeeten mit chemischen Mitteln.** [Experiments in the control of seedling diseases and root rot of Tobacco in seed-beds by chemical means.]—*Z. PflKrankh.*, xlv, 8, pp. 385–415, 7 figs., 1935.

Two principal types of tobacco seedling infection by *Pythium de Baryanum* [*R.A.M.*, xiii, p. 61], *Moniliopsis aderholdi* [ibid., vii, p. 765], *Pseudomonas tabaci* [*Bacterium tabacum*: see preceding and next abstracts], and the generally less important *Thielavia* [*Thielaviopsis*] *basicola* [ibid., xiii, p. 276] were differentiated at the Munich Agricultural Institute, namely, early and late, the latter being even more destructive than the former and frequently involving the most vigorous plants in the seed bed. Early infection almost invariably proceeds direct from the soil, while that occurring at a later stage may originate either in some extraneous source (secondary) or the development of the organisms already present in the soil may have been retarded (delayed primary infection). Only secondary infection takes place in soils that have been entirely freed from the above-mentioned fungi by a powerful disinfectant, such as formalin (1·5 to 2 per cent., 10 l. per sq. m.), paraformaldehyde (30 gm. per $\frac{1}{6}$ sq. m.), ceresan (0·25 and 0·5 per cent., 10 l. per sq. m.), germisan (0·5 per cent., 6 l. per sq. m.), and uspulun (0·5 per cent., 6 l. per sq. m., or in dust form at the rate of 0·3 to 0·5 per cent., 50 to 100 gm. per sq. m.), whereas delayed primary infection results from the use of antiseptics of limited or merely temporary efficacy, e.g., Bordeaux mixture and other copper-containing preparations, quinosol [ibid., xiv, p. 9], caustic lime, and calcium cyanamide, which can only be applied at relatively low concentrations for fear of adverse effects on the growth of the stand. A third group of therapeutic preparations comprises all those exerting a stimulatory action on the

growth of the plants and thus enabling them to withstand infection, chiefly nitrogenous fertilizers applied as top-dressings. The regular admixture of calcium cyanamide with the compost heap at the rate of 100 to 200 gm. to every two or three wheelbarrow loads of soil is one of the cheapest means of preventing severe infection of the seed-bed, but where absolute freedom from disease is required the more costly process of soil sterilization with a strong antiseptic, followed by regular treatment of the seedlings with a copper-containing mixture, must be employed. For practical purposes it will generally be sufficient either to treat the soil 14 days before sowing with 1 to 2 per cent. Bordeaux mixture, some other copper-containing preparation, or quinosol, or else to spray the emergent seedlings with 0·5 to 1 per cent. Bordeaux mixture, two applications being given at a week's interval, followed in both cases by the regular spraying schedule for the later stages of growth.

LAGATU (H.) & MAUME (L.). **Variations des rapports physiologiques en corrélation avec la maladie du feu sauvage chez la feuille du Tabac.** [Physiological variations correlated with the wildfire disease of Tobacco leaves.]—*C.R. Acad. Sci., Paris*, cci, 6, pp. 374–376, 1935.

The analysis of tobacco leaves in Dordogne showed that the nitrogen-phosphorus-potash content of those from healthy plants in a field free from wildfire [*Bacterium tabacum*: see preceding abstracts] was much higher than that of the foliage of diseased plants in an infested plot, whereas apparently healthy individuals in the latter presented an intermediate condition. Relatively to the healthy plants, the diseased ones had a low potash content as compared with nitrogen, a deficiency that may be partially corrected by lime but not to any appreciable extent by magnesium. Phosphoric acid was found to be much more abundant in the healthy than in the diseased or 'intermediate' plants. Excellent results in the control of wildfire are stated to have been obtained in 1932 by heavy liming and the application to the soil of potassium sulphate, basic slag, and groundnut cake at the respective rate of 400, 1,000, and 1,000 kg. per hect.

BRUNDZA (K.). 1. **Bandymai su Phytophthora infestans (Mont.) de Bary. 2. 1934 metais tyrinėtos Pamidoru ligos.** [1. Researches on *Phytophthora infestans* (Mont.) de Bary. 2. Experiments on Tomato diseases in 1934.]—Reprinted from *Rep. Pl. Prot. Sta. Dotnuva, 1934*, 16 pp., 5 figs., 1935. [English summary.]

Both potatoes and tomatoes in Lithuania are stated to suffer considerable damage every year from *Phytophthora infestans* [*R.A.M.*, xiv, pp. 391, 559], cross-inoculation experiments with which in the laboratory gave positive results on both hosts. Tomato leaves inoculated with a zoospore suspension of the fungus from either host developed conidiophores and conidia in six days.

In the dry year of 1934 *Septoria lycopersici* caused very heavy losses to tomatoes, amounting in some parts of the country to two-thirds of the crop, while *Phoma destructiva* [ibid., xiv, p. 263] and *Macrosporium* sp. were also responsible for severe injury. *Alternaria solani*, *Clado-*

sporium lycopersici, and *Aplanobacter michiganense* were also present and *C. fulvum* was abundant in greenhouses. A species of *Phoma*, with pycnidia measuring 100 μ in diameter and pycnospores 2 to 3 by 1 μ, was found after harvesting on the stakes up which the plants were trained. Four species of *Colletotrichum* were observed producing, respectively, light red, black-dotted, purple, and bluish-grey lesions on the fruit, and the spores of which usually measured, respectively, 13 to 21 by 4 to 7 μ (average 17·1 by 5·6 μ), 16 to 18 by 4 to 5 μ (17·4 by 4·6 μ), 22 to 25 by 3 μ (23·1 by 3 μ), and 23 to 26 by 3 μ (24·5 by 3 μ), the length of the setae being about 80, 180, 120, and 140 μ, respectively. Tomatoes infected by *C.* 1 showed the typical symptoms associated with this strain.

[Russell (T. A.).] **Scab spot or bacterial spotting of Tomatoes.**—*Agric. Bull. Bermuda*, xiv, 9, pp. 67–68, 1935.

In 1935, up to 50 per cent. of the tomatoes grown in different parts of Bermuda were unsaleable owing to bacterial spot (*Bacterium vesicatorium*) [*R.A.M.*, xiv, p. 681], previously present in the island only to a slight extent. The spots, especially on the Bonny Best variety, were frequently only one-twentieth of an inch in diameter. Inoculations with the bacterium obtained from diseased material gave positive results, the organism being re-isolated. Spraying with Bordeaux mixture failed to give control, some of the most heavily infected fields being those most thoroughly sprayed. Control by seed disinfection [cf. ibid., viii, p. 157; xi, p. 355] with mercuric chloride is to be attempted.

Kravtzeff (B. I.). **Грибные болезни Монгольского Дуба.** [Fungal diseases of the Mongolian Oak.]—*Советская Бот.* [*Sovietsk. Bot.*], Leningrad, *1935*, 2, pp. 86–98, 5 figs., 1 map, 1935.

After briefly indicating the considerable economic value of the Mongolian oak (*Quercus mongolica*) in the Amur region of the Russian Far East, where it covers an area of nearly 4,000,000 hect., the author gives a briefly annotated list of 10 species of Ascomycetes, 49 of Basidiomycetes, and 3 of Fungi Imperfecti recorded on it in that region both as parasites and saprophytes, among which the following may be mentioned. *Microsphaera alphitoides* [*M. quercina*: *R.A.M.*, xiv, p. 189] is very widespread, especially in young plantations; it occurs both in its conidial and perithecial stages, but apparently causes less injury to the host than in Europe. *Cronartium quercus* [*C. quercuum*: ibid., xiv, p. 680] is widely prevalent both on the oak and on its alternate host, the pine; it is stated that the large woody tumours caused by it on the latter are profitably used commercially because of their high content in resin and turpentine. *Hydnum erinaceus* [ibid., i, p. 443] is very common on live, and more rare on dead oaks, causing a mixed, indistinctly cylindrical, light brown heart rot, a detailed description of which is given, as well as of the rots caused by *Spongipellis* (*Polyporus*) *litschaueri* and *Phellinus* [*Fomes*] *igniarius* [cf. ibid., xiv, p. 662]. *Armillaria mellea* [ibid., xiv, p. 803] occurs practically everywhere on the living roots and stems of the oak; although the rot caused by it does not extend high up in the trunk and is not of very great economic importance, the fungus is

frequently found associated with other wood-destroying fungi, when it can be an important contributory factor in the resulting heart rot.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Service and regulatory announcements April–June 1935.—pp. 42–44, 1935.

A summary (dated 25th May, 1935) has been prepared concerning the plant quarantine import restrictions obtaining in Antigua, British West Indies, among which the Proclamation No. 1 of 8th March, 1935, is mentioned in detail. In order to prevent the introduction of Panama disease (*Fusarium* [*oxysporum*] *cubense*) [*R.A.M.*, xiv, p. 643] the importation of banana fruits is absolutely prohibited except from the other islands of the Leeward Islands (Anguilla, Dominica, Montserrat, Nevis, St. Kitts, and British Virgin Islands) and the United States of America, and banana plants or parts thereof may not be imported from the Bahamas, Bermuda, British Guiana, Central America, Dutch Guiana, and any place in the West Indies except under a licence granted by the Governor. Sugar-cane seedlings and plants or parts thereof may not be imported from any country except under licence, to preclude the entry of mosaic. A similar licence, together with a duly authenticated certificate of two years' freedom from citrus canker (*Bacterium* [*Pseudomonas*] *citri*) [ibid., xiv, pp. 64, 426, 544], is required for the importation of rooted citrus plants from Cuba, Haiti, Jamaica, Santo Domingo, and the United States. Further, in order to prevent the introduction of wither-tip (*Colletotrichum gloeosporioides*) [*Gloeosporium limetticolum*: see above, p. 14], a licence is requisite for the importation of lime plants and parts thereof from British Guiana, Dominica, Grenada, Montserrat, St. Kitts, St. Lucia, and Trinidad, and of lime fruits from the foregoing, the Bahamas, Bermuda, all other countries except the other islands of the West Indies not mentioned in this sentence, and the United States. Soils and plants growing in soil may not be imported from any country except under licence.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Plant quarantine import restrictions of the Republic of Brazil.—15 pp., 1935. [Mimeographed.]

A summary is given of the regulations dated 15th September, 1920, 21st December, 1921, and 12th April, 1934, governing the importation of plant material into Brazil [cf. *R.A.M.*, vi, p. 512]. Apart from the regulations against insect pests the importation is prohibited of banana seedlings and pseudo-bulbs to prevent the introduction of *Fusarium* [*oxysporum*] *cubense*; cacao stocks, fruits, and seeds (against *Marasmius perniciosus*); coffee stocks, berries, and seeds, and seedlings of other Rubiaceae (against *Hemileia vastatrix*); Rutaceae, including stocks, seeds, and buds of *Citrus*, *Poncirus*, *Fortunella*, *Evodia*, *Melicope*, *Casimoroa*, and *Toddalia* (against *Bacterium* [*Pseudomonas*] *citri*), and sugar-cane seedlings, cuttings, and seeds (against virus diseases). Potatoes must be accompanied by duly authenticated certificates vouching for their freedom from *Synchytrium endobioticum* and *Spongospora subterranea*, and in the case of seed from virus diseases. Cultures of bacteria and fungi injurious to plants may only be imported with the permission of the Ministry of Agriculture.

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

Vol. XV FEBRUARY 1936

Harris (H. A.). **Morphologic studies of Septoria lycopersici.**—*Phytopathology*, xxv, 8, pp. 790–799, 3 figs., 1935.

Morphological studies on material secured from a monospore culture of *Septoria lycopersici* isolated from garden-grown tomatoes at Urbana, Illinois, and treated with Dickson's combination stain (*Science*, N.S., lii, p. 63, 1920) showed the mycelium to be of two types, namely, hyaline and thin-walled (1·2 to 5·8 μ), and brown and thick-walled (2·2 to 5·8 μ), the former being characteristic of the early stages of the leaf spot and the latter of the more advanced ones. As shown by Levin (*Tech. Bull. Mich. agric. Exp. Sta.* 25, 1916), the mode of pycnidial formation is symphyogenous. The pycnidial cavity is initiated by a schizogenous process, but pycnospore production is also preceded by a lysigenous action. The pycnospores are formed by basipetal elongation of the sporogenous cells, separation from which is effected by a basal constriction, without intervening conidiophores. They germinate by the formation of a lateral germ-tube from the middle cells and by elongation of the terminal ones. Ostiole formation is induced by the tensional strain of the pycnidial wall on the leaf epidermis, and by pressure of the pycnospores on the pycnidial wall. Tomato leaves are penetrated by the fungus through the stomata, the mycelium developing intercellularly and the cells being entered by means of haustoria.

Pirone (P. P.). **Spotted wilt of Tomatoes and Peppers in New York.**—*Plant Dis. Reptr*, xix, 15, p. 244, 1935. [Mimeographed.]

Spotted wilt of tomatoes [*R.A.M.*, xiv, p. 763] is stated to have been recognized for the first time in New York State during the summer of 1935, when suspected material from Onondaga County was verified by M. Gardner. For two consecutive years pepper [*Capsicum annuum*] leaves and fruits, especially of the California Wonder variety, in Schenectady County have borne the large ring spots characteristic of tomato spotted wilt. Needle-prick inoculations of young pepper plants with inoculum from diseased pepper leaves (but not from the fruits) induced marked dwarfing with considerable foliar mottling and slight distortion.

Solovieff (F. A.). Физические и механические свойства древесины Клена с начальной стадией гнили от гриба **Fomes connatus Fr.** [Physical and mechanical properties of Norway Maple wood in the incipient stage of the rot caused by *Fomes connatus* Fr.]—*Mitt. forsttech. Akad., Leningrad, 1935*, 6, pp. 22–46, 6 figs., 1935.

Recent investigations showed that in the region of Leningrad from

61 to 100 per cent. of the Norway maples (*Acer platanoides*), aged from 60 to 120 years, are affected with an internal condition of the trunk locally known under names equivalent to 'false core' or 'dark heart'. In cross section this condition appears as a roughly circular, dark grey area, separated from the normal light coloured wood by a dark green line, 1 to 1·5 mm. in width. It was shown experimentally to be the incipient stage of the heart rot caused by *Fomes connatus* [*R.A.M.*, xi, p. 173], frequently involving 78 per cent. of the length of the useful part of the maple trunk, while the more advanced, destructive stage of the rot is for the most part restricted to the base of the trunk and seldom involves more than 17 per cent. of the total length. Special tests showed that the 'false core' wood is but slightly inferior in its mechanical properties to healthy wood, and that it may be safely used in positions sheltered from weather variations and especially from humidity. The wood is valuable for joinery work, owing to its often beautiful pattern and pleasant colour, and also to its slightly superior hardness and lesser hygroscopicity. In advanced stages of the rot, the wood is broken down and cavities are formed, the decayed wood being fibrous and not powdery.

The paper gives brief notes on the less frequent rots in the region due to *F. igniarius* [ibid., xv, p. 63], *F. fomentarius* [ibid., xiv, p. 795], *Polyporus spumeus*, *P. squamosus* [ibid., xiv, p. 794], *Hydnum septentrionale* [ibid., v, p. 394], and *Armillaria mellea* [ibid., xv, p. 63]. It also contains a list of other broad-leaved trees, on which *F. connatus* has been found in the region.

VAILONIS (L.). **Lietuvos Beržų rėta.** [The 'wisa' disease of Birch in Lithuania.]—*Scr. Hort. bot. Univ. Kaunas*, iii, pp. 5–36, 4 pl., 1935. [Lithuanian, with German summary.]

The external symptoms of the 'wisa' disease of birches [*R.A.M.*, xii, p. 253] in Lithuania were found to correspond with those described from Finland by Hintikka, but the explanation given by the latter of its etiology as a masked gummosis is not regarded as convincing. The disease occasions the development of local pathological symptoms in the pith of the younger branches of the stem, and the writer's studies indicate that the disturbance is initiated by chemical compounds in groups of the primary cambium cells destined to develop into vessels. This leads to the formation of abnormal tissues containing hardened resinous substances, as shown by micro-analytical tests, the pathological changes involved being particularly conspicuous along the walls. The internal 'chemical wounds' thus arising are the starting-point for the production of specific hormones which stimulate the adjacent healthy tissues to abnormal action. These substances are quite distinct from the ordinary wound hormones and may be diffused through the trunk by means of the medullary rays to produce further abnormalities. In due course the affected cambium recovers and begins to produce normal vessels.

WOLF (F. A.). **The perfect stage of a leafspot fungus on Red Mulberry.**—*J. Elisha Mitchell sci. Soc.*, li, 1, pp. 163–166, 2 pl., 1935.

Emended Latin diagnoses are given of *Mycosphaerella mori* (Fkl) and

of its conidial stage which was first named *Fusarium maculans* Béreng. but is transferred by the author to *Cercosporella* as *C. maculans* comb. nov., other synonyms being *Septoria mori* Lév., *Fusisporium mori* Mont., *Phleospora mori* (Lév.) Sacc., *S. moricola* Pass., and *Phleospora moricola* (Pass.) Sacc. [*R.A.M.*, viii, p. 339]. The fungus is stated to be a common agent of a fuscous to ochraceous, brown-edged leaf spot of the red mulberry (*Morus rubra*) in the eastern United States, Great Britain, France, Italy, Germany, and Lower Austria. The natural host of the organism not being available for inoculation experiments, the evidence for a genetic connexion between the perithecial and conidial stages rests on the presence of perithecia in old conidial lesions, the similarity of cultures isolated from conidia and ascospores, and the previously established relationship between certain other fungi with analogous imperfect and perfect stages.

The fungus is characterized by short, hyaline conidiophores, 3- to 10-septate, hyaline conidia, 20 to 60 by 5 to 8 μ, gregarious, spheroid, membranaceous, dark-coloured perithecia, 60 to 80 μ in diameter, and basally fasciculate, clavate, aparaphysate asci, 35 to 40 by 5·5 to 6·5 μ, containing eight subdistichous, curved, uniseptate ascospores, 12 to 14 by 3·5 to 4 μ.

KIMURA (K.). **A new disease of Mulberry-tree caused by Claudopus nidulans (Pers.) Peck.**—*Appl. Mushroom Sci.*, i, 1, pp. 9–16, 5 figs., 1935. [Japanese, with English summary.]

Claudopus nidulans has been observed to occur as a wound parasite of mulberry in the Nagano and Ehima prefectures, Japan, the sporophores usually appearing from the middle of June to the end of July. The fungus attacks and eventually kills the sapwood, the heartwood being only superficially invaded; ultimately the whole tree dies. The pale colour and fragile consistency of the decomposed wood place the agent of decay in the lignin-dissolving group [cf. *R.A.M.*, xiv, p. 667, 668]. The elliptical spores of the fungus measure 7 to 8·8 by 3·5 to 4·5 μ and are pink in the mass.

CORMIO (R.). **Contributo di osservazioni sul Ganoderma applanatum (Pers.) Pat. e sulla sua azione sul tronco di Abete rosso, Picea excelsa Link.** [Observations on *Ganoderma applanatum* (Pers.) Pat. and its action on the trunk of Red Spruce, *Picea excelsa* Link.]—8 pp., 12 figs., Milan, 1935. [Abs. in *Riv. Pat. veg.*, xxv, 7–8, p. 319, 1935.]

An account is given of the growth of the fruiting body of *Ganoderma applanatum* [*R.A.M.*, xv, p. 16] on an old trunk of spruce (*Picea excelsa*) killed by unfavourable soil conditions and infested with animal parasites. The growth of the fruit body and effect of the fungus on the wood and heartwood are described in detail.

ANDREYEFF (I. E.). Сердцевинная гниль Пихты в северно-восточной части южного Урала. [Heart rot of the Spruce in the north-eastern part of southern Ural.]—*Mitt. forsttech. Akad. Leningrad, 1935*, 6, pp. 113–124, 3 figs., 1935.

Firs (*Abies*) and Spruce (*Picea*) in the Bashkir Republic of the U.S.S.R.

is stated to be attacked chiefly by *Pholiota adiposa* [see below, p. 72] and *Fomes hartigii*, the first of which causes a heart rot in the lower part of the trunk and extending into the roots. The affected tissues are canary-yellow at first, and later drab brown; short sinuous cracks appear in the rotted wood, rather like insect tunnels but resembling, in tangential sections, shallow cells. Occasionally narrow, sinuous black lines occur in the wood, and in the final stage of the rot a hollow is formed. *F. hartigii* causes a heart rot which is yellowish-brown at first and later light yellow. The decayed timber contains thin, white mycelial membranes, appearing in radial sections as white spots, and also numerous black lines. Surveys in the region showed that the total average incidence of the two rots varies in the various stands from 11·8 to 24·3 per cent., the percentage of the trees in the incipient stage of the rot varying from 5·4 to 5·9. Special tests [details of which are given] indicated that the timber of such trees is but very slightly inferior in its mechanical and physical properties to that of healthy trees, and that it may be quite safely used after proper seasoning for constructional purposes, provided it is not exposed to damp situations.

Vanine (S. I.) & Andreyeff (I. E.). Физические и механические свойства древесины Ели с начальной стадией гнили от гриба **Fomes annosus.** [Physical and mechanical properties of Fir timber in the initial stage of the rot caused by *Fomes annosus*.]—*Mitt. forsttech. Akad. Leningrad, 1935*, 6, pp. 9–21, 4 diags., 1935.

A tabulated account is given of experiments, the results of which showed that fir [*Abies* sp.] timber affected with the initial stage of the rot caused by *Fomes annosus* [*R.A.M.*, xiv, p. 663], characterized by a bluish-purple or occasionally brownish-yellow discoloration, is but slightly inferior in its mechanical properties to sound timber; its resistance to lateral compression and to bending was found to have been lowered by 2·4 to 8·4 per cent., and by 3 per cent., respectively, of that of sound wood. The hardness of the affected wood, on the other hand, was increased by 4·7 to 6·6 per cent. and the specific gravity by 0·5 to 4·1 per cent., while its water-containing capacity was lowered by 10·2 per cent. of that of sound wood. Shrinking from desiccation and swelling from moisture imbibition in the affected wood were not materially altered.

Liese [J.]. **Zur Bildung von Kiefern-Hexenbesen.** [On the formation of Pine witches' brooms.]—*Z. Pilzk.*, xix, 2, p. 55, 1 fig. on pl. 8 facing p. 49, 1935.

Further evidence is very briefly adduced in support of the heritability of witches' brooms of pines in Germany [*R.A.M.*, xiii, p. 202]. Cones from diseased trees produced offspring of which one part showed the typical witches' broom habit, a second grew normally, while a third exhibited comparatively mild symptoms. The condition must be regarded, in the light of these facts, as a bud mutation.

Miller (J. K.). **A new species of Keithia on Red Cedar.**—*J. Elisha Mitchell sci. Soc.*, li, 1, pp. 167–171, 1 pl., 1935.

An English diagnosis, accompanied by a very brief Latin one, is given

of *Keithia juniperi* n.sp., found parasitizing red cedar (*Juniperus virginiana*) leaves in North Carolina in 1934. The disease, which may involve the death and subsequent desiccation of the foliage, may be recognized by the presence on the lower leaf surfaces of one to three black apothecia, which remain attached to the substratum for an indefinite period and may be detected in a decaying condition on fallen material. Infected leaves persist on the trees for the normal period, and though the disease may be abundant on individual trees its economic significance cannot yet be definitely assessed; it is thought, however, to be of potentially serious import to red cedar. In its morphology the new *Keithia* generally resembles the four other known representatives of the genus, except for its eight ascospores, which are olive-brown, uniseptate, 28 to 30 by 15 to 18 μ, with very unequal cells, the distal invariably the larger, and are contained in olive-brown, broadly ovate, paraphysate asci, 80 to 90 by 40 to 50 μ.

HEPTING (G. H.). **Blue stain development in peeled Shortleaf and Loblolly Pine pulpwood.**—*Paper Ind.*, xvii, 6, pp. 402–404, 1 diag., 3 graphs, 1935.

In the course of observations on felled 30-year-old shortleaf pine [*Pinus echinata* Mill.] in North Carolina and on 32-year-old loblolly [*P. taeda* L.] in South Carolina, little difference was detected in the amount of blue stain [*Ceratostomella* spp. and other fungi: *R.A.M.*, xiv, p. 612] of the sapwood of timber stacked in different ways, details of which are given. In both species of pine practically all the staining developed during the first six weeks of stacking, at the close of which period 33 per cent. of the sapwood volume of the shortleaf bolts was stained and 36 per cent. of that of the loblolly. In the former species 58 per cent. of the stain was graded as dark, 37 per cent. medium, and 5 per cent. light, the corresponding figures for the latter being 38, 55, and 7 per cent., respectively. A preliminary test in the treatment of the pulpwood with one of the effective stain-preventive solutions extensively used on the timber at southern sawmills gave promising results, reducing the incidence of infection from an average of 15 per cent. to nil.

HATFIELD (I.). **Toxicity in relation to the position and number of chlorine atoms in certain chlorinated benzene derivatives.**—*Proc. Amer. Wood Pres. Ass., 1935*, pp. 57–66, 1 fig., 1935.

A tabulated account, preceded by an introductory note and a brief historical survey of previous investigations on analogous lines, is given of the writer's tests on the toxicity of fifty chlorinated benzene derivatives [*R.A.M.*, x, p. 766; xiii, p. 791] to the blue-staining organisms, *Ceratostomella pilifera* and *C. pluriannulata* [ibid., xiv, p. 729] and to *Fomes annosus* [ibid., xiv, p. 276 *et passim*]. An analysis of the toxicological information obtained by the comparison of chlorinated chemicals with their unchlorinated mother substances failed to show any rule governing the relationship between position of substitution and toxicity, the latter being apparently unpredictable on the basis of the structure of the chemical. Of the substances tested, 2, 3, 4, 6-tetrachlorophenol, 2, 4, 5-trichlorophenol, and 2-chloro-orthophenylphenol and the sodium

salts of these chemicals showed the highest degree of toxicity to the organisms used in the tests.

AGUSTONI (ENRICA). **Osservazioni e ricerche sul 'nerume' del Cavolfiore.** [Observations and researches on Cauliflower black spot.]—*Riv. Pat. veg.*, xxv, 7–8, pp. 305–315, 1 pl., 1935.

During the winter of 1934–5 cauliflowers reaching market in Milan from various parts of Italy were severely affected by a black spot which spread so rapidly to the healthy plants in the consignments that it rendered the produce unsaleable. The affected heads bore numerous, minute, blackish-brown, velvety spots which enlarged and generally became confluent, covering a quarter or more of the surface. The diseased tissues were olivaceous-brown, moist, and malodorous, the discoloration extending up to half-way towards the interior, but not farther.

All the lesions contained numerous bacteria, the larger ones also showing the presence of *Alternaria brassicae* (Berk.) Sacc. [*R.A.M.*, xiv, p. 494]. The bacterium was motile, ovoid, Gram-negative, non-acid fast, 1·5 to 2·7 by 0·8 to 0·9 μ, forming on meat extract peptone agar pellucid, yellowish-white, superficial, round colonies with a sub-transparent, depressed, pale straw-coloured halo; it is identified as *Bacterium maculicola* [ibid., xi, pp. 146, 745].

Inoculations by means of a platinum needle of healthy cauliflowers with an aqueous suspension of the bacterium gave positive results, as did inoculations of wounded cauliflowers by sprinkling with the same suspension; similar inoculations with *A. brassicae* gave slighter infection. It is concluded that neither organism is capable of attacking perfectly healthy tissues directly, but that both enter the host through wounds set up by mechanical agency. The different forms of cauliflower black spot reported from time to time are regarded as all manifestations of one and the same disease which may develop in the field or during transport or storage.

RENARD (P.). **Une maladie du Chou : la hernie ou gros pied.** [A Cabbage disease: hernia or club root.]—*Vie agric. rur.*, xxiv, 37, pp. 167–169, 3 figs., 1935.

A popular note is given on club root of cabbage and other crucifers (*Plasmodiophora brassicae*) in France, where it is stated to have been first observed on cauliflowers near St. Malo in 1820, 84 years after its detection in England. Danish, German, Dutch, and Belgian workers are said to have obtained good control of the disease by the application to the soil of 300 to 500 kg. per hect. of calcium cyanamide [*R.A.M.*, x, p. 574; xi, p. 686; cf. also ibid., xiv, p. 807].

SHERWOOD (S. F.). **Sclerotium rolfsii, a fungus pest of California Sugar Beets.**—*Facts ab. Sug.*, xxx, 11, p. 427, 1935.

Referring to the occurrence of *Sclerotium rolfsii* as a major pest of sugar beets [cf. *R.A.M.*, xi, p. 349] in the central parts of California in 1931, 1932, and 1933, when losses exceeding 50 per cent. in large acreages of the crop were not infrequent (see 'Southern root rot on field crops in California' issued by the California College of Agriculture

Extension Service [mimeographed]), the writer states that the first definite identification of the disease was made in 1927 in the Sacramento Valley, the fungus having probably been introduced into the State from outside. The application to the soil of a dilute formaldehyde solution may be effective against the disease over a limited area, but for large-scale control the cultivation of resistant varieties is recommended. Care should be taken not to transport the fungus into disease-free districts by means of soil accumulating at beet dumps or adhering to waggons and equipment.

KOTILA (J. E.) & COONS (G. H.). **Boron deficiency disease of Beets.**—*Facts ab. Sug.*, xxx, 10, pp. 373–376, 4 figs., 1935.

Heart and dry rot of beets, hitherto reported only from Europe [*R.A.M.*, xv, p. 1], is stated to have developed in Michigan and Ohio. The typical symptoms of the disease as it occurs in the field were observed in young beet plants growing in crocks containing clean sand with a modified Knop's solution. The plants were removed from the sand and classified as 'injured' or 'apparently normal', and replaced in the sand in nutrient solutions with and without (*a*) boric acid and (*b*) phosphorus. After a month necrotic symptoms began to appear in all the jars not receiving boron, whereas at the end of 45 days nearly all the plants (both healthy and injured) supplied with boric acid were in sound condition. Phosphorus deficiency was apparently not a factor in the development of necrosis.

In a second series of cultures, 1 per cent. borax solution was added to glass sand and a nutrient solution in one-gallon crocks planted with sugar beet, at the rate of 0·0, 0·2, 1·2, 2·4, 4·8, and 9·6 c.c. per jar, these being the quantities computed to correspond to 0, 1, 5, 10, 20, and 40 lb. borax per acre. It was found that the 1 and 5 lb. per acre treatments were insufficient to prevent necrosis, whereas at and above 10 lb. no symptoms of disease developed. The most vigorous growth was made by the plants receiving the 20 lb. treatment.

Four roots from plants showing typical heart and dry rot symptoms in the field were used in another test. Two were cut in half lengthwise; one half was planted in a jar of sand with a nutrient solution with boric acid, this being omitted from the similar solution in which the other half was placed. The two other roots were planted in two other jars, one with and one without boric acid. After 35 days, wilting, dwarfing, and necrosis were all present on the plants in jars without boron, whereas the other plants were some 10 in. taller with a much better developed root system and no symptoms of necrosis.

A cursory survey of the affected regions showed the disease to be most prevalent in sandy or gravelly loam soils with a porous subsoil, the symptoms assuming a severe form in up to 15 per cent. of the stand and occurring in an incipient stage in at least 25 per cent. of the remainder.

PASSECKER (F.). **Der Shiitake oder Pasaniapilz (Cortinellus Shiitake P. Henn.).** [The shiitake or Pasania fungus (*Cortinellus shiitake* P. Henn.).]—*Z. Pilzk.*, xix, 2, pp. 58–59, 1 fig. on Pl. 7, 1935.

A German description is given of *Cortinellus shiitake* P. Henn. [see next abstract], the fructifications of which were obtained in pure culture

in the writer's laboratory in Vienna from a consignment of spores from Japan, where (as also to some extent in China) the mushroom is stated to be extensively cultivated and greatly prized for culinary purposes. There seems to be no reason why *C. shiitake* should not become naturalized in Central Europe.

Hiroe (I.). **Establishment of applied Mushroom science in Japan.**—*Appl. Mushroom Sci.*, i, 1, pp. 1–5, 6 figs., 1935.

'Applied mushroom science' is understood by the author as a branch of applied mycology comprising morphological, physiological, ecological, and systematic researches on mushrooms, methods of cultivation and utilization, problems of sanitation, and the like, which are to be investigated at the Tottori Agricultural College, where special facilities have been made available. The journal, of which the present is the first issue, is designed to extend the knowledge of this subject, and for the benefit of foreign readers it is proposed to furnish English summaries. The number of species of edible mushrooms in Japan is estimated at over 140 [see next abstract], some of which have been cultivated from early times. These include the pine mushroom (*Armillaria mellea*) or matsutake [*R.A.M.*, xiv, p. 284], *Cortinellus shiitake* P. Henn. [see preceding abstract] (shii-take), and *Collybia velutipes* (enoki-take), and the nameko group [ibid., xiii, p. 287], including *Pholiota adiposa* [see above, p. 68], *P. mutabilis*, *Auricularia auricula-judae* [ibid., vi, p. 127] (kiku-rage), and *Pleurotus ostreatus* [ibid., xii, p. 343] (hira-take).

Hiroe (I.). **List of edible Mushrooms in Japan.**—*Appl. Mushroom Sci.*, i, 1, pp. 24–29, 1935. [Japanese.]

An alphabetical list is given of the scientific names of the 137 species of edible fungi recognized in Japan [see preceding abstract].

Golding (F. D.). **A probable vector of Cassava mosaic in Southern Nigeria.**—*Trop. Agriculture, Trin.*, xii, 8, p. 215, 1935.

When 814 adult individuals of the Aleyrodid *Bemisia nigeriensis* Corbett collected from mosaic cassava [see below, p. 76] in the field in Southern Nigeria were introduced during the period 21st March to 8th April, 1935, into a cage containing two healthy and two mosaic cassava plants, mosaic symptoms appeared on 9th April on two young leaves of one of the healthy plants, though two healthy cassava plants in a control cage kept free from the insects showed no sign of the disease [*R.A.M.*, xiv, p. 217]. This result indicates that the Aleyrodid can transmit cassava mosaic and it is hoped to confirm this by additional evidence.

Plantesygdomme i Danmark 1934. Oversigt, samlet ved Statens plantepatologiske Forsøg. [Plant diseases in Denmark in 1934. Survey of data collected by the State Phytopathological Experiment Station.]—*Tidsskr. Planteavl*, xl, 5, pp. 713–766, 11 figs., 2 graphs, 1935. [English summary.]

This report, compiled by E. Gram and his collaborators, follows the usual lines [*R.A.M.*, xiv, p. 78]. White tip (reclamation) disease (chiefly of oats) [ibid., xii, p. 656, and below, p. 86] is stated to be

declining in Denmark owing to the general use of copper sulphate in affected soils. The abnormally dry conditions prevailing over most of the country in 1934, especially during July, favoured unusually severe outbreaks of grey speck in rye, wheat, barley, oats, beets, potatoes, and cocksfoot grass [*Dactylis glomerata*], the beneficial effects of manganese sulphate on which [ibid., xiv, p. 677; xv, p. 8 and below, p. 87] have been found to persist for three years.

A characteristic disturbance of swedes and turnips involving a dark discoloration and rotting of the vascular bundles is provisionally attributed to the agency of bacteria, which were isolated in profusion from the diseased material. There was some indication that stable manure is a factor in the spread of infection.

The risk of infection by the ascospores of the apple scab fungus (*Venturia inaequalis*) was observed during four years' investigations to be greatest from the first emergence of the flower buds until the end of blossoming [cf. ibid., xiv, pp. 589, 590].

Two bacterial diseases of ornamentals new to the country are reported. Cineraria [*Senecio cruentus*] leaves bore dark, circular or angular lesions up to 0·5 cm. in diameter, mostly surrounded by a pale margin, and containing numerous bacteria. Control was obtained by spraying with 50 gm. sanagran [ibid., xiii, pp. 151, 204] plus 65 gm. isinglass in 100 l. water. Greenhouse hydrangea leaves were also attacked by a bacteriosis in the form of light or dark pale-bordered lesions, with numerous minute spots along the leaf margins.

VAN POETEREN (N.). **Verslag over de werkzaamheden van den Plantenziektenkundigen Dienst in het jaar 1934.** [Report on the work of the Phytopathological Service in the year 1934.]—*Versl. PlZiekt. Dienst Wageningen*, 80, 108 pp., 2 pl., 1935.

This report, prepared on the usual lines [*R.A.M.*, xiv, p. 11], contains the following among many other interesting items. Oats seedlings submitted for inspection from Zealand bore the brown longitudinal stripes characteristic of *Helminthosporium avenae* [ibid., xiv, p. 690], which is stated to be more prevalent than commonly believed. The application to wheat crops, while moist, of manganese sulphate [see preceding abstract] caused a brown discoloration of the foliage. Both wheat and barley in plots receiving no potash suffered more severely from mildew (*Erysiphe graminis*) [ibid., xv, p. 9] than in those supplied with this element.

'Pseudo-wart disease' of potatoes, characterized by the outgrowth from the eyes of excrescences resembling those of true wart [*Synchytrium endobioticum*], was found to be due to the formation of numerous shoots remaining in an arrested state of development.

Large, greyish-brown, somewhat swollen lesions on the trunks of young standard apple trees were found to contain the pycnidia of *Phomopsis mali* [ibid., xv, p. 33]. Among the substances tested for the control of apple and pear scab [*Venturia inaequalis* and *V. pirina*], Bayer's Bordeaux (1 per cent.) gave encouraging though not entirely uniform results. Tested on Manx Codlin apples the standard Bordeaux gave the highest percentage of scab-free fruit (97·3), though it caused severe injury [ibid., xv, p. 36]. Shirlan A.G. (0·4 per cent.) [ibid.,

xiv, p. 9] was ineffective while para Bordeaux (1·25 per cent.) combated the disease but caused very severe injury. Brown spots in the cortex of pears contained *Gloeosporium* [*Neofabraea*] *malicorticis* [ibid., xiv, p. 12], a virulent parasite of this host. *Nectria galligena* was prevalent on pear fruits in the shape of circular, brown, necrotic lesions. *Microstroma juglandis* [ibid., ix, p. 275] was reported on walnut from two localities in a mild form.

Hard-husked scarlet runners [*Phaseolus multiflorus*] are stated to be normally more resistant to rust (*Uromyces appendiculatus*) [ibid., xiv, p. 734] than those of softer texture, but a weakening of this property appears to have occurred in the Erecta variety, leading to infection during the period under review.

Lime trees were attacked, and in some cases totally defoliated, by *Gloeosporium* [*Gnomonia*] *tiliae* [ibid., viii, p. 289]. Willows, especially of the 'grey' type [*Salix caprea* or *S. cinerea*], in an experimental planting at Neerlangbroek (Utrecht), were infected by *Physalospora miyabeana* [ibid., xiv, p. 479]. A severe die-back of another variety is tentatively attributed to a species of *Fusarium* which was consistently isolated from the dead branch tips.

F. nivale [*Calonectria graminicola*], one of the agents of 'brown patch' of golf-greens [see below, p. 102], was very satisfactorily controlled at Noordwijk by a mixture of 60 gm. calomel [mercurous chloride] and 30 gm. mercuric chloride per sq. m. strewn evenly over the affected surface.

Fruits of an undetermined species of *Polygonum* found among the refuse of a summer wheat crop were infected by *Ustilago utriculosa* [ibid., xii, p. 277], which thus performs a useful service in suppressing the propagation of the weed. Another valuable fungus is the parasite (*Darluca filum*) [ibid., xi, p. 91] of willow rust (*Melampsora* sp.) [ibid., xi, pp. 139, 157, 412], which considerably reduced the virulence of the disease in 1934.

Promising results were given by the treatment of Glory, Mansholt, and Zelka pea seeds showing 11 to 24 per cent. infection by *Ascochyta* [ibid., xii, p. 483] with 2 per cent. ceresan liquid, ceresan dust, and abavit universal [ibid., xiv, p. 20, and below, p. 83], the two last at the rate of 2 gm. per kg.

Good control of hop downy mildew (*Pseudoperonospora humuli*) [ibid., xiv, p. 792] in the newly established plantings at Amerongen and Rhenen has been obtained by the application of nosperit [ibid., xiv, p. 659], which is apparently used on a large scale in Belgium for this purpose.

Details are given of a number of local tests of various standard and proprietary fungicides, of which the following may be mentioned. 'Damping-off' of dahlia cuttings [*Pythium de Baryanum* and other fungi] was very satisfactorily combated by soil sterilization with aretan at the rate of 8 l. per sq. m. of a 0·25 per cent. solution, or by immersion of the cuttings in a 0·125 per cent. solution, the incidence of infection among untreated plants in infested soil being 75 per cent. Shirlan A.G., though not completely effective against *Cladosporium fulvum* on tomatoes, maintained the plants in good health for a much longer period than the untreated controls. Mercuric chloride (1 in 1,500) is

stated to be coming more and more into use for the disinfection of potting soil against *Rhizoctonia* [*Corticium*] *solani*, a parasite of various ornamentals such as cacti, *Bouvardia*, and *Cyclamen* [*persicum*]; care should be taken to pour clean water over the leaves of the last-named and other sensitive plants to avoid the risk of scorching.

Laboratorio de Criptogama. [Cryptogamic Laboratory.]—*Mem. Trab. Estac. Fitopat. Agríc. Coruña 1934*, pp. 35–41, 1935.

The following are among the items of interest in this report. *Armillaria mellea* appears to be only one of the factors involved in the root rot and consequent desiccation of vines and fruit-trees [*R.A.M.*, xiii, p. 745] throughout Galicia, Spain, the others being as yet unknown.

Heavy damage is caused to the Galician maize crop by *Gibberella moniliformis* [ibid., xiv, pp. 297, 493] in its conidial stage (*Fusarium moniliforme*) both in the field and in storage under conditions of extreme humidity and high temperature. The germination of diseased grain in sterilized soil with severe, slight, and no external symptoms was reduced in each lot by 100, 80, and 40 per cent., respectively. Healthy seed-grain sown in infected soil germinated to the extent of 90 per cent., while 100 per cent. germination was obtained with seed from apparently sound ears from diseased plots. The last lot, transferred to test-tubes on Sachs's liquid medium on 28th March, showed slight symptoms of infection on 16th April, and on 2nd May the fungus was observed in the decaying roots.

Nectria galligena was isolated from pear [see preceding abstract] and *Macrophoma reniformis* [*Physalospora baccae*: ibid., vi, p. 81] from vine. 'False black root' of vine, caused by *Guignardia baccae* (Cav.) Jacz., occurred in its pycnidial (*Macrophoma*) stage on plants suffering from anthracnose (*Gloeosporium ampelophagum*) [ibid., xiv, p. 616]. *Venturia cerasi* [ibid., xiv, p. 589] was reported on cherries from La Coruña, where it is believed to be widespread.

Mycosphaerella pinodes [ibid., xiv, p. 613] caused heavy damage to peas.

Chestnuts in the province of Lugo were severely injured in 1934 by the leaf spot due to *Phyllosticta maculiformis* [ibid., xii, p. 252], which appears to be favoured by a southern exposure.

Stell (F.). **Report of Mycologist, 1935.**—*Rep. Dep. Agric. Trin. Tob. 1934*, pp. 47–50, 1935.

The following items of interest occur in this report [*R.A.M.*, xiv, p. 13]. No appreciable economic loss now results from sugar-cane mosaic in Trinidad [ibid., ix, p. 131], but the disease is still present in the northern and central cane belts. Spread is due chiefly to the planting of infected cuttings, and systematic roguing keeps the disease well in hand.

Owing to increased planting, Panama disease of bananas (*Fusarium* [*oxysporum*] *cubense*) has recently become considerably more prevalent [ibid., xiv, pp. 13, 181]. Some estates have a fairly high incidence of infection even among plants producing the first crop, and scattered failing stools are found almost everywhere.

Gros Michel bananas were attacked by 'moko' [*Bacterium solanacearum*: ibid., xiv, pp. 155, 181], especially in lands recently cleared

from high woods. Typically, leaf symptoms are almost absent, but on affected plants which possess fruit bunches individual fingers here and there show a characteristic premature yellowing and the fruit stalks have discoloured vasculars. B.D.K. oil is now the stock treatment for killing off the diseased stools; in comparative tests with various chemicals this oil gave the best results, though sodium arsenite (1 lb. per gall. of water) was fairly effective.

In certain districts cacao witches' broom (*Marasmius perniciosus*) [ibid., xiv, pp. 13, 155] has become more prevalent and severe. At the Government Estate at Marper the loss of mature pods in 1933 amounted to about 1 per cent. of the total crop; in 1934, the figure was about 2 per cent. All diseased material is destroyed on this estate once a month, the cost of this work being at present uneconomic. It is safe to say that losses of 5 to 10 per cent. are common in some districts; on some properties the losses sustained are probably appreciably higher. During 1934, 150,000 cacao trees growing on some 500 acres in the most severely infected areas were examined to determine the incidence of the disease; subsequent monthly inspections were made to ascertain if any trees showed high resistance or immunity. By the middle of the year it was found that 108 quarter, 81 half, and 132 full trees, making 321 in all, were still unaffected, but at the end of the year the total figure had fallen to 92 (comprising 29 quarter, 17 half, and 46 full trees); it was anticipated that a large percentage of the healthy trees would become infected within a few months. Small nurseries have been established in certain localities from pods selected from highly resistant trees.

The characteristic and dominant shade trees in the cacao fields are the immortels known locally as bocare [*Erythrina velutina*] and anarca [*E. umbrosa*], the former being found chiefly in low-lying areas and the latter at higher elevations. Both are liable to diseases caused by various environmental factors and also to infection by a species of *Sphaerostilbe*. Fructifications of the fungus (*Stilbum* and perithecial stages) are conspicuously present, but the organism has not attacked cacao. The treatment recommended for the dead trees consists in scorching the areas where the fructifications are visible, and afterwards felling and burning. If replacement is desired, *Gliricidia* sp. or some trees other than immortels should be planted.

MILES (A. C.). **Report on the Department of Agriculture, Gold Coast, for the year 1934–35.**—17 pp., 1935.

This report contains, *inter alia*, the following items of phytopathological interest. Encouraging results have been obtained on the Gold Coast in breeding types of cassava resistant to mosaic [see above, p. 72]. Germination of the seeds was at first slow and uncertain, but the use of a solar propagator increased the germination percentage considerably and reduced the time required for germination to take place from about six weeks to a fortnight. Of 95 seedlings so far produced, 36 are over nine months old and have shown no natural infection by mosaic, while 12 of the latter remained unaffected when artificially infected by budding from infected stock. In one small test with cuttings from 20 of the new seedlings, 10 (of which 4 had remained unaffected after artificial

infection) remained free from mosaic under field conditions. More extensive tests are required before definite conclusions as to the immunity of these types can be reached, as experience has shown that cassava varieties brought from lightly to heavily infected areas may show at first an apparent immunity which is not maintained after one or two seasons' exposure to infection in the new environment.

Experimental evidence demonstrated that although properly dried cacao exhibits a definite equilibrium between its water content and the relative humidity of the air, this normal equilibrium breaks down once active mould formation begins, even though the cacao may afterwards be dried to 8 per cent. water content, above which point mould growth is induced [*R.A.M.*, ix, pp. 163, 164]. The effect of the moulds is to change the water-absorbing properties of the cacao, so that in an atmosphere safe for the storage of cacao free from moulds actively mouldy produce will continue to absorb moisture beyond the normal equilibrium point, with the result that moulding proceeds progressively.

Tobacco leaf curl was introduced to the Gold Coast during the period under review on the seed of Bourbon tobacco from Mauritius. The seed had been distributed in the Eastern Province before the disease was observed and complete eradication from this area will be difficult. Streak was noted on sugar-canes imported from South Africa and the affected plants were immediately destroyed. Citrus scab [*Sporotrichum citri*] was also introduced on material from South Africa; its occurrence was not noted for some time but measures for its control are being vigorously prosecuted.

NARASIMHAN (M. J.). **Report of the Mycological Section for the year 1933–34.** *Admin. Rep. agric. Dept. Mysore 1933–34*, pp. 19–22, 1935.

Further spraying tests in Mysore against areca palm [*Areca catechu*] koleroga [*Phytophthora arecae*: *R.A.M.*, xiii, p. 682] showed that the addition of groundnut oil to Bordeaux mixture (at the rate of $\frac{1}{4}$ gall. oil to 100 galls.) improved the physical character and efficacy of the latter, not one tree in the 30 gardens sprayed with the oil-Bordeaux mixture becoming affected, though the disease reappeared in areas sprayed with casein Bordeaux. It is hoped that the use of groundnut oil will supersede casein, which at present is imported into Mysore at an annual cost of nearly Rs. 40,000 [£3,000].

An obscure disease of *A. catechu*, known locally as 'hidimundigeroga', and hitherto supposed to be of physiological origin, was ascertained to be associated with a longitudinal fissure in the crown extending from the top of the stem to a portion of the bud. Growth becomes arrested. No wound is visible externally, the injury becoming apparent only after the removal of two or three leaf sheaths. The inflorescences are affected and start to decay as they are formed, diseased trees probably never bearing fruit. The crown dries up within six to eight months without the internal injury becoming manifest.

Sporadic cases were noted of a marasmioid thread blight on coffee somewhat similar to, but not identical with, the 'Javanese cobweb' disease [ibid., viii, p. 777].

In further spraying tests against *Alternaria* disease of potatoes [*A. solani*: ibid., xiii, p. 683] promising results were given by a mixture of 1 lb. calcium arsenate in 50 galls. water, with lime-caseinate spreader.

Chrysanthemum rust [*Puccinia chrysanthemi*] was widely prevalent at Malur, the chief centre of chrysanthemum-growing in Mysore, and later was also very common in all the chrysanthemum fields round Bangalore. The disease generally appears when the crop is about to bud, assuming an epidemic form as flowering begins; finally the whole plant dries up.

Betel nut [*Piper betle*] sprayed with Bordeaux mixture ($\frac{1}{2}$ per cent.) plus casein or oil, or oolite sulphur developed less mildew [? *Oidium* sp.: ibid., xiii, p. 682] than unsprayed plants, only the new leaves becoming affected.

Other records include *Corticium salmonicolor* on coffee, *Phyllosticta* sp. on cucurbit leaves, *Corticium vagum* [*C. solani*] on beet, *Diplodia* die-back [? *D. natalensis*] of limes, *Cercospora* sp. on sesame, and *Alternaria* sp. on gori (*Cyamopsis psoralioides*).

THOMPSON (A.). **The Mycological Division.**—*Rep. Dep. Agric. F.M.S., 1934*, pp. 61–63, 1935.

The following items, apart from those already noticed from other sources, are included in this report. An investigation of oil palm stem rot [*Fomes noxius*: *R.A.M.*, xiv, pp. 81, 791] showed that in Malaya the fungus does not normally penetrate into the inner stem tissues until a moderately large area of outer stem has become affected, and the treatment of suspected cases can therefore be delayed until definite symptoms have been observed. An oil palm root disease associated with *Ustulina zonata* was recorded in Malaya early in 1934. No external symptoms became apparent until an advanced stage had been reached. *Poria ravenalae* was associated with premature withering of the lower leaves of a group of oil palms the roots of which were decayed; abnormally dry soil conditions appeared to favour the disease.

About 60 areca palms [*Areca catechu*] growing near a wire fence were injured by lightning, 20 fatally; the remainder appeared to recover, but about eight months later some showed stem bleeding accompanied by borer attack [cf. ibid., xii, p. 506]. *Ganoderma lucidum* was found on the stems of the same host.

The most serious tobacco disease was again *Bacterium solanacearum* [ibid., xiii, pp. 216, 657; xiv, p. 659; see also below, p. 111]; losses ranged from 43 to 100 per cent. on White Burley and Joyner varieties. The presence of tobacco mosaic was confirmed by transmission experiments with juice from mottled, blistered, and distorted leaves. Differences in the symptoms produced indicated the presence of more than one virus.

A comparison of cultures from 'red root' of tea in highland and lowland areas indicated that in Malaya two fungi may be responsible for those root diseases of tea in which the common symptom is the production of red rhizomorphs on the outside of the roots. The fungus present on the lowland tea was *G. pseudoferreum* [ibid., xii, p. 248], while that on the highland tea resembled *Poria hypolateritia* [ibid., xiii, p. 216]. Root disease of tea from both localities was caused by *U. zonata* [ibid., x, p. 160].

Pseudomonas citri was isolated from grapefruit leaves from the Cameron Highlands, and was shown to be pathogenic to grapefruit and limes.

Potato blight (*Phytophthora infestans*) was recorded for the first time in Malaya in three holdings in the Cameron Highlands. The meteorological records from this area indicate that the local weather conditions are suitable for the propagation of the fungus throughout the year. *Alternaria* blight [*A. solani*] affected backward potato plants in the same district.

A dwarfing of *Crotalaria anagyroides* associated with leaf mottle and chlorosis was also investigated.

Fifty-third Annual Report of the Ohio Agricultural Experiment Station 1933–1934.—*Bull. Ohio agric. Exp. Sta.* 548, 120 pp., 13 figs., 4 graphs, 1935.

The following items of interest, apart from those noticed from other sources, occur on pp. 32–38 of this report [cf. *R.A.M.*, xiii, p. 684]. Alexander found that in tests of seedlings of 180 tomato varieties for resistance to *Septoria* [*lycopersici*] all the varieties became heavily infected, with the exception of an occasional, very much stunted plant, and when potted plants of these varieties were tested again, they all developed very severe infection [ibid., xii, p. 11].

Tilford reports that the yields of potato plots sprayed throughout the season with the high- and low-lime Bordeaux mixtures 4–6–50 and 5–2½–50 were, respectively, 359·8 and 367·1 bushels per acre, as against 317 for a set of plots sprayed at a concentration of 8–4–50 for the first application, 6–3–50 for the second, 4–2–50 for the third to the seventh, and 2–1–50 for the eighth; the unsprayed controls yielded 200 bushels per acre.

Treatment of four varieties of gladiolus corms against scab [*Bacterium marginatum*: ibid., xii, p. 356; xiii, p. 168] by immersion for five minutes in calogreen (1 oz. per gall. water), or the same plus mercuric chloride (1 in 1,000), or for 2 hours in mercuric chloride alone (1 in 1,000) gave, respectively, 80·6, 83·2, and 60 per cent. clean corms, as against only 24·5 per cent. in the untreated controls.

So far 11 elms affected with Dutch elm disease [*Ceratostomella ulmi*: ibid., xiv, p. 726, and below, p. 125] have been noted in the state of Ohio. Confirmation of the discovery by Miss Buisman of the perithecial stage [ibid., xi, p. 409] was obtained by Swingle, and wound inoculations of healthy American elms with ascospores of the fungus gave positive results.

MALLAMAIRE (A.). **French West Africa: diseases of plants cultivated in the Ivory Coast.**—*Int. Bull. Pl. Prot.*, ix, 9, pp. 198–200, 1935.

A list is given of the fungi (mostly well-known), bacteria, and nematodes occurring on industrial trees and shrubs [cf. *R.A.M.*, xv, p. 16], fruit and food crops, leguminous cover plants, and vegetables in the Ivory Coast.

CAMUS (J. S.). **Annual Report of the Director of Plant Industry for the fiscal year ending December 31, 1934.**—103 pp., 19 pl., 1935.

In the section on plant pathology (pp. 76–80) of this report, the

following items, *inter alia*, are noted. The causal organism of citrus *Phytophthora* blight in the Philippine Islands was identified as *P. faberi* [*P. palmivora*: *R.A.M.*, xiv, p. 627]. Grapefruit was unaffected, but Siamese seedless pomelo, Batangas mandarin orange, Villafranca lemon, Washington Navel orange, and King mandarin orange were badly diseased. A species of *Pythium* was associated with a serious tissue rot of the bark and outer portions of mango roots.

Of thirteen abaca [*Musa textilis*] varieties so far tested, Sinibuyas, Kinalabao, and Putian showed high resistance to bunchy top [ibid., xiv, p. 37]. Immature fruits of Latundan, Gloria, and Saba bananas affected by black tip invariably yielded a fungus closely resembling *Helminthosporium torulosum* [ibid., xiv, p. 323].

Preliminary studies indicate that cotton leaf curl is spread locally by cotton leafhoppers [*Empoasca flavescens*]. Cotton leaf spot (*H. gossypii*) is present in Manila and Silang, where it may have been introduced on imported seed. A virulent outbreak of tobacco bacterial wilt (*Phytomonas solanaceara*) [*Bacterium solanacearum*: see above, p. 78] attacked 90 per cent. of the plants in the Economic Garden, Los Baños, Laguna.

Strawberry root stocks from the Baguio Semi-Tropical Fruit Station were attacked by a serious disease due to a *Fusarium*, which destroyed 95 per cent. of the plants when planted at lower altitudes; fungicidal disinfection of the root stocks reduced the effects of the disease.

Black smut of rice (*Tilletia horrida*) [ibid., xiv, p. 222] retarded growth and markedly reduced the yield and market quality of the rice. It prevails only in irrigated fields, and plants become predisposed to it when planted during the dry season. The *Fusarium* rice disease recently reported [ibid., xiv, p. 120] is not widespread and can be controlled by roguing and the destruction of the affected plants.

Breed (R. S.) & Brooks (R. St. J.). **Report on proposals submitted by R. E. Buchanan and H. J. Conn relative to the conservation of Bacillus as a bacterial generic name, fixing of the type species and of the type or standard culture.**—*Zbl. Bakt.*, Abt. 2, xcii, 24–26, pp. 481–490, 1935.

In accordance with the resolution of the Paris Congress of the International Society of Microbiology, 1930, the Nomenclature Committee was duly appointed by the individual National Committees of the Society, and invitations to serve on the Committee were extended to the members of the Sub-Committee on Bacterial Nomenclature of the International Botanical Congress. In January, 1931, a proposal was made by R. E. Buchanan for the conservation of *Bacillus* as a generic name, supplemented by a recommendation by H. J. Conn for the retention of the 'Marburg' strain of *B. subtilis* as the type strain. An analysis of the expressions of opinion by members of the Committee on these proposals revealed an over two-thirds majority in favour of them, further action on which may therefore be taken if deemed advisable at the forthcoming Second International Congress for Microbiology in London in July, 1936.

The resolutions of the Nomenclature Committee on the above-mentioned proposals are therefore as follows: The Committee agrees that (1) *Bacillus* Cohn, 1872, should be designated as a *genus conser-*

vandum; (2) the type species should be known as *B. subtilis* Cohn, 1872; (3) the type (or standard) strain should be the Marburg strain; (4) the type (or standard) strain of *B. subtilis* Cohn, 1872, together with a complete description, should be maintained at each of the recognized type culture collections; (5) the genus *Bacillus* should be so defined as to exclude bacterial species not producing endospores; (6) the term *Bacillus* should be used as a generic name and differentiated from the term 'bacillus' as a morphological description.

Details of the proposals are set forth in eight appendices.

LEBEZHINSKAYA (Mme V. D.). К методике выделения фитопатогенных бактерий. [On the methods of isolation of phytopathogenic bacteria.]—*Микробиол.* [*Microbiol.*], iv, 2, pp. 254–257, 1935. [English summary.]

The following facts were ascertained in the course of work at the U.S.S.R. Plant Protection Institute on isolation methods for phytopathogenic bacteria. Warm water was superior to alcohol for the preliminary treatment of the material while mercuric chloride (1 in 1,000) was the best of the disinfectants studied. Omeliansky's medium with the addition of glucose and gentian violet [*R.A.M.*, xiv, p. 758] proved to be the most suitable for the isolation of the organisms used in the trials. The percentage of positive results was increased by the preliminary grinding of the material under observation in a mortar with sterile water.

KHUDIAKOFF (J. P.). Литическое действие почвенных бактерий на паразитные грибы. [The lytic action of soil bacteria on parasitic fungi.]—*Микробиол.* [*Microbiol.*], iv, 2, pp. 193–204, 7 figs., 1935. [English summary.]

Two species of bacteria, a *Pseudomonas* and an *Achromobacter*, capable of inducing lysis in *Fusarium* spp. and certain other fungi, were studied at the Moscow Microbiological Institute and methods for their rapid isolation in pure culture elaborated. These organisms are widespread in various soils, but they are also absent from a considerable number, including those in which flax exhaustion, associated with *F. lini*, is prevalent [*R.A.M.*, xiv, p. 635]. *F. lini*, introduced into soils containing active lytic bacteria, fails to develop, nor does the inoculation of such soils with the organism result in wilting of the plants. Wheat is protected from attack by *F. graminearum* [*Gibberella saubinetii*] in soil inoculation tests by the simultaneous introduction with the fungus of the lytic bacteria, the same effects ensuing if the latter are incorporated with the soil 24 hours earlier. Other species of *Fusarium* undergoing lysis by these bacteria were *F. herbarum*, *F. equiseti*, *F. scirpi* [ibid., xiii, p. 593], and *F. culmorum*, besides *Botrytis cinerea* and *Sclerotinia* sp.

HAVAS (L.). **Follicular (oestrus) hormone and plant tumours.**—*Nature, Lond.*, cxxxvi, 3439, p. 516, 1935.

Previous experiments having indicated that female sex hormones produce marked effects on certain plants, an aqueous solution of commercial crystalline follicular hormones was introduced through a petiolar stump into tomato plants, which were subsequently inoculated

above and below the petiole with *B[acterium] tumefaciens*. The average weights of the resultant tumours per plant in the 31 plants so treated were 0·303 gm. below the petiolar stump and 0·554 gm. above it (an increase of about 80 per cent.), the corresponding figures for 21 controls injected with distilled water being 0·427 and 0·452 gm., and for ten receiving hormone-free extract of animal tissue 0·423 and 0·407 gm., respectively.

WILSON (A. R.). **The influence of Phytomonas tumefaciens and Phytomonas rhizogenes on the actual acidity of certain liquid and agar substrata.**—*Phytopathology*, xxv, 9, pp. 854–863, 2 graphs, 1935.

A detailed account is given of the studies conducted at Wisconsin University on the changes induced by the growth of the crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*: one pathogenic strain and one non-pathogenic) and hairy root (*P.* [*Bact.*] *rhizogenes*) [*R.A.M.*, xiv, p. 289] organisms in carrot and yeast infusion-glucose-mineral salts agar and liquid media at 26° to 32° C.

Both organisms were found to induce more rapid changes in P_H value in agar than in liquid media. In yeast infusion-glucose-mineral salts agar *Bact. tumefaciens* produced little alteration in reaction, whereas *Bact. rhizogenes* caused a speedy fall, followed by an almost equally rapid rise; in the corresponding liquid medium the latter brought about a continuous fall. In carrot infusion media a rise in P_H value occurred in cultures of all these strains. The non-pathogenic strain of *Bact. tumefaciens* differed from the pathogenic one only in the production of slightly more acid in the yeast infusion-agar medium, similar results being obtained both at 26° and 32° (respectively below and above the critical maximum temperature range for crown gall infection) [ibid., v, p. 348]. Free ammonia was formed both on liquid and agar carrot infusion and yeast infusion-glucose-mineral salts by *Bact. rhizogenes*, and on liquid carrot infusion alone by *Bact. tumefaciens*. This process is thought to be the cause of the rapid rise in P_H value in the carrot infusion cultures; the subsequent fall, where such occurs, is possibly due either to reduced ammonia production coupled with the formation of carbon dioxide or other acid substances from the medium, or to the utilization of ammonia by *Bact. tumefaciens* [cf. ibid., xv, p. 5].

KNAPP (A. W.). **Scientific aspects of Cacao fermentation.**—*Bull. imp. Inst., Lond.*, xxxiii, 1, pp. 31–49; 2, pp. 147–161; 3, pp. 306–319, 4 pl., 3 figs., 1 diag., 1 graph, 1935.

The author gives a detailed and fully documented account of the process of cacao fermentation as carried out in various countries, including West Africa, the West Indies, Ceylon, Dutch East Indies, Porto Rico, Haiti, and San Domingo, and surveys the work already accomplished as well as the field for further research in this important branch of the industry. The micro-organisms found on fermenting cacao are discussed in some detail [*R.A.M.*, xi, p. 31; xiv, p. 224], particularly in relation to temperature; a succession of changes occurs in the flora during the course of fermentation. The subject of mould damage, the most serious of all defects of the bean, is reviewed both

with reference to the moulds occurring during fermentation and those developing after drying [see above, p. 77]. In the final section the biochemical aspects of the pulp and sweatings are noticed.

Becker (K. E.). **Das Wichtigste zur Herbstbeizung.** [The essentials of autumn disinfection.]—*Dtsch. landw. Pr.*, lxii, 36, pp. 437–438, 1935.

In connexion with some general directions for the autumn treatment of cereal seed-grain, the writer calls attention to some important changes in the authorized German preparations [*R.A.M.*, xv, p. 6], chief among which is the restriction of the term 'universal' to those applicable to wheat, barley, oats, and rye. The abavit-universal dust [see above, p. 74] thus becomes merely abavit-u., while the universal dust ceresan will still be known simply as ceresan dust. The preparations known as betanal liquid [ibid., xii, p. 306], sublimoform [ibid., xii, p. 305], and drawin have been withdrawn from the official catalogue. Preference should as a general rule be given to the 'universal' preparations (viz., abavit-nassbeize Schering, ceresan nassbeize U. 564, fusariol 157, germisan and uspulun universal, and universal dust ceresan U.T. 1875 a). The advantages and drawbacks of the various methods of treatment (immersion, sprinkling, short disinfection process, and dusting) are briefly discussed and the most suitable disinfectants for use, with directions for their application, in each case indicated.

Sibilia (C.). **Ricerche sulle ruggini dei cereali. La specializzazione della 'Puccinia triticina' Erikss. in Italia.** [Researches on cereal rusts. The specialization of *Puccinia triticina* Erikss. in Italy.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 2, pp. 277–300, 4 figs., 1 map, 1935.

Between April, 1934 and May, 1935 the author made 24 collections of *Puccinia triticina* from different parts of Italy. Inoculation experiments on eight standard wheat varieties showed that the collections consisted of nine physiologic forms [*R.A.M.*, xiv, pp. 227, 496, 748], eight of them new, viz., four collections from Turin belonged to form LV, two from Milan to LVI, one from Bari and two from Brescia to LVII, seven from Padua, Sassari, and Barcellona (Messina) to LVIII, one from Ancona to LIX, one from Campotosto and two from Rome to the well-known form XV [*R.A.M.*, xiii, p. 689], another from Campotosto to LX, one from Caserta to LXI, and one from Cerignola to form LXII. This distribution is clearly shown on a map.

Forms LV, LVI, LVII, LIX, and LXI were moderately virulent, and only a few of the eight wheats tested (particularly Malakoff) showed resistance to them. Forms XV, LVIII, LX, and LXII produced no serious infection on any variety, the least virulent form being XV, which produced a fairly high degree of infection only on the Mediterranean and Democrat varieties. Forms LVIII, LX, and LXII were of medium virulence, producing heavy infection on four varieties. Form LX (from Campotosto) was remarkable in that it produced maximum infection on the resistant Malakoff variety, as well as on Webster, though form XV, also from Campotosto, did not infect either variety. Of the wheats tested only Mediterranean showed maximum infection by all the forms; Malakoff completely resisted infection by

all except forms LX and LIX. The methods and apparatus used in the work are described in detail.

SIBILIA (C.). **Le forme ecidiche del 'Berberis aetnensis' Presl.** [Aecidial forms on *Berberis aetnensis* Presl.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, pp. 355–362, 4 figs., 1935.

In June, 1935, *Berberis aetnensis* growing on Mount Etna showed the presence of the aecidial sori of *Puccinia graminis* and of those of another species. The former, which affected large portions of the leaves and were also present on the leaf stalks, produced very numerous cylindrical aecidia, 580 to 600 μ high by 520 to 550 μ in diameter, while the aecidiospores measured 20 to 27 μ in diameter. The second species occurred only on the leaf blade, and produced small uredosori with a few aecidia measuring over 1 mm. long by 450 to 480 μ in diameter; the aecidiospores were 18 to 24 μ in diameter. The aecidiospores of *P. graminis* gave 8 to 10 and those of the second species 60 to 65 per cent. germination in water and agar. Inoculations on twenty varieties of wheat and one of rye with aecidiospores of the two species resulted in infection by *P. graminis* only, two wheat varieties developing uredosori after 13 days.

MACKIE (W. W.). **Aeroplane dusting with sulphur to combat stem rust of Wheat.**—Abs. in *Phytopathology*, xxv, 9, pp. 892–893, 1935.

Very good control of stem [black] rust of wheat [*Puccinia graminis*] was obtained in the San Joaquin Valley, California, in 1935, by dusting with sulphur (25 lb. per acre) from aeroplanes, of which up to 13 were operating simultaneously [*R.A.M.*, xiii, p. 499]. The sulphur was passed through a 325-mesh screen before use. The work commenced at daylight and continued until about 9 a.m., and between 29th April and 14th May an area of 22,000 acres was covered. The most suitable period for the treatment was between the anthesis and hard dough stages (roughly three weeks). One application checked the attacks for about a week, while a second ten days later ensured an entirely satisfactory result.

PITTMAN (H. A.). **The rusts of cereals.**—*J. Dep. Agric. W. Aust.*, 2nd Ser., xii, 3, pp. 367–375, 5 figs., 1935.

In this semi-popular account of cereal rusts in Australia it is stated that stem [black] rust (*Puccinia graminis tritici*) has made the growing of wheat unprofitable in the coastal areas of New South Wales, but Western Australia suffers less from infection than any other part of the continent. It became epidemic in 1934 in the northern parts of the Australian wheat belt, the yield in many places being reduced by 75 to 80 per cent. The district worst affected is the humid Midland-Geraldton-Northampton coastal area. *P. simplex* [*P. anomala*] on barley has not yet been recorded in Western Australia.

VIENNOT-BOURGIN (G.). **Contribution à l'étude des cryptogames de Seine-et-Oise (10ᵉ Note).** [A contribution to the study of the fungi of Seine-et-Oise (10th Note).]—*Rev. Path. vég.*, xxii, 3, pp. 181–199, 4 pl., 5 figs., 1935.

After referring to the rare records of *Ustilago tritici* attacking leaves

of wheat, the author describes in detail an infection of this character on a badly diseased plant of the Bon Fermier variety observed at Grignon in July, 1935. Compared with normally infected plants the ear was compressed, very short, and almost enclosed in the sheath, even at maturity. The most striking symptom was that the blade of the last leaf was either flat or rolled up into a spiral. From the last node to the tip of the blade stripes developed parallel to the veins, arising as a series of small, greenish-white swellings, sometimes agglomerated into warty nodules. On the blade, deep furrows appeared along which the leaves split into strips, edged by the exposed spores. Two of the six stalks showed no ear, the undeveloped ear being found below the third node, much reduced and not conspicuously smutted. Microscopic examination showed the mycelium to be actively developed in the foliar tissues, the formation of spores being observed in sacs which burst when the spores were mature.

An anatomical study of affected spikelets showed that the fungus attacks the glumes causing the formation of lesions between the veins, without first invading the ovary to any special degree. The paleae are very strongly attacked, only traces of the upper one being recognizable. The ovary is displaced, usually towards the lower palea, and at the base it bears numerous wart-like lesions allowing the spores to escape. The stigmas can be recognized as glandular structures with spine-like branches. The rapid development of the mycelium completely disorganizes the tissues.

Nattrass (R. M.). **Smut diseases of cereals.**—*Cyprus agric. J.*, xxx, 3, pp. 77–78, 1935.

In this brief note the author gives a popular summary of the treatments applicable for the control of bunt [*Tilletia caries* and *T. foetens*] and loose smut [*Ustilago tritici*] of wheat, and loose and covered smuts of barley [*U. nuda* and *U. hordei*], which are stated to cause serious losses each year to cereal growers in Cyprus. Covered smut of barley is stated to be controllable by dusting the seed-grain with flowers of sulphur.

Vosbein (O.). **Können wir uns gegen die Fusskrankheit schützen?** [Can we guard against foot rot?]—*Mitt. Landw., Berl.*, l, 39, p. 827, 1935.

A brief account is given of the occurrence of foot rot in cereals (chiefly winter wheat) [attributed mainly to *Fusarium culmorum*: *R.A.M.*, xiii, p. 23] in the Kleinwanzleben (Magdeburg) district of Germany in relation to cultural practices. Particularly heavy damage was observed in 1935 in winter wheat following beets and potatoes, the pathogens having persisted in the soil since the previous wheat or barley stand by which root crops are almost invariably preceded [cf. ibid., xiv, p. 748]. Oats may safely be introduced into the rotation scheme, while infection will be gradually eliminated from the soil by the successive cultivation of root crops or lucerne. Deep ploughing-under of the diseased stubble is not a guarantee of good health in the next crop, for the fungi may easily be brought to the surface in a viable condition by cultural operations in time for reinfection. Late sowing

(end of November or early December for wheat and after 20th September for barley) is the most effective means of combating foot rot.

MITRA (M.) & BOSE (R. D.). **Helminthosporium diseases of Barley and their control.**—*Indian J. agric. Sci.*, v, 4, pp. 449–484, 2 pl. [1 col.], 4 graphs, 1935.

Spot blotch of barley (*Helminthosporium sativum*) [*R.A.M.*, xiv, pp. 80, 91] is stated to be common at Pusa and in the neighbourhood, causing a foot and root rot of the seedlings, in addition to the leaf symptoms. It lowers the percentage of germination and reduces the crop yield. Net blotch (*H. teres*) [ibid., xiv, pp. 80, 299] is common in the United Provinces and Nepal, but at Pusa is restricted to only a few introduced types, and has not been observed to attack the roots. Stripe disease (*H. gramineum*) [loc. cit.] is very rare at Pusa, possibly because the temperature does not fall sufficiently low to permit infection [ibid., v, p. 288], but it does occur in the United Provinces and Nepal, where the soil temperature is lower.

The damage caused by *H. sativum* to various types of Pusa barley varied from season to season and from plot to plot. The percentage leaf area affected by the fungus on 24 numbered types of barley during the years 1930–4 showed that none was immune, though some were resistant, infection varying from 0 to 11·0, 0 to 14·2, 0 to 6·75, and 1·1 to 22·6 per cent. in the four seasons, respectively, the corresponding figures for *H. teres* being 0 to 27·9, 0 to 25·4, 0 to 20·4, and 0 to 20·7 per cent. Observations showed that heavy dew and rain together with high temperatures are favourable to infection by *H. sativum*, the optimum temperature for the growth of the fungus being between 25° and 30° C., while the spores are capable of germinating between 8° and 35°. At the time when barley is sown at Pusa, the mean atmospheric and soil temperatures are near the optimum for the fungus, and hence considerable damage is caused in the seedling stage. With the lower temperatures prevailing during the winter months the activity of the fungus declines, but only to increase again in the spring when the temperature rises, the new activity causing secondary infection. Early varieties escape infection owing to the lower temperatures prevailing at the time they mature.

Details are given of various experiments made during 1930–4 on the control of spot blotch by seed disinfection. Good results were obtained with uspulun in the three seasons 1931–4, while ceresan in 1933–4 was even more effective; sulphur, mercuric chloride, and formalin were less satisfactory. Though the treatments controlled seedling infection to a greater or lesser extent, they failed to check secondary infection from air-borne spores from other host plants. This latter type of infection is, however, less important than the former, and it may be possible to breed new types of barley resistant to this phase of the disease. Crop rotation is recommended as a means of reducing the likelihood of infection occurring from the soil.

RADEMACHER (B.). **Bekämpfung der Heidemoorkrankheit.** [Control of the heath bog disease.]—*Mitt. Landw., Berl.*, 1, 37, pp. 791–792, 3 figs., 1935.

Most of the information in this article on the control of the reclama-

tion disease of oats [see above, p. 72, and next abstract] and other crops in Germany has already been noticed from other sources [*R.A.M.*, xiv, p. 575], but the following supplementary items are of interest. The copper sulphate which has given such excellent results in the control of the disease during the past decade is generally applied at the rate of 50 to 150 kg. per hect. in the finely crystallized form known as 'snow', costing M. 22 to 25 per doppelzentner. Only minute traces of copper (30 to 50 gm. per hect., for instance, being detected in the straw of an entire crop of oats) are absorbed by the plants from the soil, with the result that the effects of a single application persist for a number of years. The reclamation disease may be largely combated by the provision of an ample water-supply, special care being taken to prevent undue loosening of the soil and the extensive formation of dry mould.

STEENBJERG (F.). **Undersøgelser over Manganinholdet i dansk Jord. III. Om Forholdet mellem Planternes Vækst og Jordens ombyttelige Manganmaengde.** [Investigations on the manganese content of Danish soil. III. On the relation between plant growth and the amount of exchangeable manganese in the soil.]—*Tidsskr. Planteavl*, xl, 5, pp. 797–824, 1 graph, 1935. [English summary.]

Continuing his studies on the manganese content of Danish soils [*R.A.M.*, xiv, p. 393; xv, p. 8], the writer determined three values, namely, (1) the total amount of exchangeable manganese as expressed in milli equivalents per 27·5 kg. of air-dry soil (TMn), (2) the q-value, a measure of the difficulty experienced by the plants in absorbing the exchangeable manganese, and (3) a combination, by means of an equation, of these two values into a third (Mt), indicating the amount of available manganese in grams per hect. and growing period. During the period from 1932 to 1934, 279 soil samples from grey speck-diseased [see preceding abstract] and healthy crops (Borris oats, barley, rye, wheat, sugar and fodder beets, swedes, and potatoes) were collected and analysed on these lines. The resultant data showed that a TMn value below 0·5 involves a serious risk of grey speck, which in fact occurred in 95 per cent. of the samples from such soils; on the other hand, with a TMn value equal to or above 2·0, the disease is of little importance, having been found in only 5 per cent. of the material examined. The Mt limits above and below which grey speck did and did not appear, respectively, were found to be 60 and 300 to 400. On the basis of 30 field experiments on the effects of successive increasing doses of lime, an empirical equation was formulated to express the TMn value as a function of the hydrogen-ion concentration or the increase in the P_H of the soil.

MACKIE (W. W.), JOHANN (HELEN), & STEVENS (N. E.). **An unidentified species of Sphaeropsis on Maize in California.**—Abs. in *Phytopathology*, xxv, 9, p. 893, 1935.

In 1933 maize in two localities of California was affected by a disease involving premature ripening and stunting of the ears, which contained shrivelled kernels. Numerous lesions were borne on the first, second, or third internodes only, and much resembled the uredosori of stem [black] rust [*Puccinia graminis*]. During the maturation of the ears

the lesions erupt and the stalks become brittle, readily breaking under wind or other stresses. On a medium consisting of agar and maize stalk shavings mycelial growth was scanty, but pycnidia containing unicellular spores were formed, whereas on oat agar a heavy greyish-green stroma developed but no pycnidia appeared. The spores of the fungus, which is believed to be a species of *Sphaeropsis*, averaged about 15 μ in length, which agrees fairly well with *S. ambigua* recorded on maize. Further studies are necessary, however, for the final determination of the fungus.

Ruggieri (G.). **Alterazioni in 'Citrus sinensis' Osbeck determinate da 'Mycosphaerella aurantiorum' n.sp.** [Lesions on *Citrus sinensis* Osbeck caused by *Mycosphaerella aurantiorum* n.sp.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 2, pp. 338–346, 8 figs., 1935.

Oranges growing at Fondi, Italy, showed one or more dark chestnut, round, depressed, hard lesions 3 mm. or more in diameter and covered in the chamois-coloured centre with minute dark spots. The epicarp and the outermost layers of the mesocarp under the lesions usually showed a dark discoloration sometimes reaching the endocarp. No internal rot was present. The discoloured tissues were disorganized and contained a thick weft of mycelium. The globose, chestnut-coloured pycnidia measured 82 to 123 μ in diameter, and contained hyaline, fusiform, uniseptate spores, 18 to 22 by 8·4 to 10·8 μ, borne on short, filamentous conidiophores. The fungus is referred to *Septoria* and is named [with a Latin diagnosis] *S. aurantiorum* n.sp.

Inoculations of wounded and unwounded oranges with pure cultures gave positive results only on the former. The fungus caused the characteristic discoloration, but did not produce subepidermal pycnidia.

In culture a perithecial stage developed, which the author names [with a Latin diagnosis] *Mycosphaerella aurantiorum* n.sp., characterized by subglobose, depressed, chestnut-brown perithecia 100 to 125 μ in diameter; the shortly stipitate, cylindrical asci measured 51 to 53 by 7 to 7·5 μ and contained 8 distichous, fusoid or curved, hyaline, mostly uniseptate, non-constricted ascospores, 9·6 to 12 by 2·9 to 3·6 μ; paraphyses were not seen.

Young leaves of orange nursery stock showed infection apparently due to the same fungus. They bore round spots 1 mm. or more in diameter, at first yellowish in the centre with a dark chestnut rim, but later becoming whitish. They were most conspicuous on the upper surface, and were surrounded by a pale green halo. Pycnidia corresponding to *S. aurantiorum* were formed on the affected spots. Inoculations of oranges with the organism isolated from the leaves produced symptoms typical of infection by *S. aurantiorum*, but in culture the reisolated fungus did not give rise to the perithecial stage.

Ruggieri (G.). **Alterazioni su frutti di 'Citrus sinensis' Osbeck causate da 'Phoma aurantiiperda' n.sp. e da 'Septoria citricola' n.sp.** [Lesions on fruits of *Citrus sinensis* Osbeck caused by *Phoma aurantiiperda* n.sp. and *Septoria citricola* n.sp.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 2, pp. 313–322, 7 figs., 1935.

In 1935, oranges growing at Fondi, Italy, showed a round, hard, light

chestnut spot 1 cm. or more in diameter at the stylar end. Sections through the spots showed a dark discoloration of the epicarp and mesocarp, while the endocarp and the adjacent areas of the flesh were disorganized, blackened, or completely carbonized. In the deeper tissues dark olivaceous hyphae were present, and bore black, globose pycnidia 85 to 110 μ in diameter, containing hyaline, bacteriform spores, 2·4 to 3 by 1 to 1·6 μ, borne on short sporophores. The fungus is named [with a Latin diagnosis] *Phoma aurantiiperda* n.sp.

Inoculations of healthy wounded and unwounded oranges with pure cultures of the fungus gave positive results on wounded fruit only. Field and laboratory observations showed that the disease develops slowly inside the fruits, affected oranges seldom rotting either on the trees or on the ground, the outward symptoms of infection (the final stage) becoming manifest only after several days in storage.

Other oranges in the same groves showed one or more depressed, irregular, soft spots, chestnut-coloured at the centre and chamois at the periphery, and about 1 sq. cm. or more in area. The underlying tissues showed a rot closely resembling that due to *P. aurantiiperda*, the affected tissues containing a hyaline mycelium (olivaceous-brown in the deeper parts) with subglobose or ellipsoidal pycnidia, measuring 102 to 144 μ in diameter, and containing hyaline, filamentous, bacillary, non-septate spores 18·5 to 22·5 by 1·5 to 1·9 μ. The fungus is regarded as a new species of *Septoria* and is named [with a Latin diagnosis] *S. citricola* n.sp. Inoculations of wounded and unwounded oranges gave weakly positive results on the former only.

Ruggieri (G.). **Forme nuove di gommosi ed intumescenze delle foglie di Arancio.** [New forms of Orange leaf gummosis and intumescences.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 2, pp. 347–354, 6 figs., 1935.

Young oranges in a nursery at Fondi developed a form of gum spot [*R.A.M.*, xii, p. 759] in which small, irregularly arranged punctiform lesions appeared on the under surface of the leaves, and coalesced into raised, chestnut-coloured to very dark brown pustules, 4 to 5 mm. wide. Small, yellow depressions and pock marks appeared on the upper leaf surface over the larger pustules.

Histological examination revealed a diffused hyperplasia of the spongy parenchyma and active tangential division of the cells. The intercellular spaces were filled with hyperplastic tissue, the affected part being double its normal thickness and frequently rupturing, exposing the necrosed elements within. This hyperplasia was always accompanied by gummification of the cell contents. The process began in a guard-cell of the lower epidermis, spread to the adjoining cells and the mesophyll, and frequently reached the palisade and upper epidermis.

Though the cause of the condition has not yet been ascertained it is considered to be due to some external factors which either kill the cells and set up gum formation or stimulate cell growth.

Fawcett (H. S.). **Prevention of brown rot gummosis on young Citrus trees.**—*Pacif. rur. Pr.*, cxxix, 19, p. 495, 1935.

To prevent brown rot gummosis (*Phytophthora citrophthora* and *P.*

parasitica) [*R.A.M.*, xiii, p. 301; xv, p. 14] under Californian conditions citrus trees on sweet orange or other susceptible stocks should be so planted that after settling, the first main lateral roots will be not more than 2 in. at most below the surface of the soil. Earth must also be prevented from coming into contact with the base of the tree. The bark from a distance of 6 or 8 in. above the base and down to the first main lateral roots should be protected by drawing back the soil and applying zinc sulphate-copper sulphate-hydrated lime dust (12–1–6) round the base of the trunk (2 oz. per tree). The application should be made just after planting and may be repeated after the second or third irrigation. Alternatively, the same mixture in water may be applied as a thin paste or spray. A third method is to pour the powder mixed with an equal amount of sand into a paper 'collar' fixed round the base of the trunk [ibid., xiii, p. 437]. If Bordeaux powder is used in the first two methods (it is too strong to be used in the collar) not more than ½ oz. is required for each tree. Water must be kept from the trunk as soon as possible, and the soil cleared away exposing the top of the first main lateral roots. As the trees grow older more of the mixture may be used.

Rayner (M. C[heveley]). **Mycorrhizal habit in the genus Citrus.**—*Nature, Lond.*, cxxxvi, 3439, pp. 516–517, 1935.

Briefly drawing attention to the confirmation by Reed and Mlle Frémont of her observations in California on the relation of the mycorrhizal habit of growth in *Citrus* to an erratic response to the application of nitrogenous fertilizers [*R.A.M.*, xiv, p. 710], the writer again urges the necessity of expert diagnosis of root condition in respect to mycorrhizal equipment both as an index of soil environment and as a guide to efficient manurial treatments of crops having regular mycorrhizal associations.

Bitancourt (A. A.) & Jenkins (Anna E.). **Areolate spot of Citrus caused by Leptosphaeria bondari.**—*Phytopathology*, xxv, 9, pp. 884–886, 1 pl., 1935.

English and Latin diagnoses are given of *Leptosphaeria bondari* n.sp., the agent of areolate spot, a disease of citrus described by G. Bondar (*Bol. Lab. Path. veg. Bahia*, 7, 1929) as occurring in Bahia, Brazil, and recently observed in southern Brazil, Dutch Guiana, and Venezuela. The fungus, which produces zonate spots, up to nearly 4 cm. in diameter, pale at the centre, turning brown towards the periphery, often surrounded by a conspicuous yellow halo, on the leaves and twigs of oranges, lemons, and limes, is characterized by asci 60 to 70 μ long containing eight 3- to 5-septate, brown ascospores 21–24 μ long; spherical pycnidia (*Coniothyrium* stage), 60 to 161 μ in diameter, with spores 4 by 2 to 3 μ; similar pycnidia on the lesions, apparently belonging to the same organism, bore 4-septate spores 20 μ in length. At San Paulo monospore cultures were made from the ascospore and conidial stages of *L. bondari*, of which the former yielded a *Hendersonia* (possibly the septate conidial form mentioned by Bondar) while only *Coniothyrium* was derived from the latter. Inoculations with both cultures gave inconclusive results.

According to Bondar, the areolate spot is not new to Brazil, having

caused heavy damage in Bahia ten years before his report was published. He considered that the same disease had been ascribed in San Paulo to *Phyllosticta hesperidearum* [*R.A.M.*, xiii, p. 90] and in Ceylon to *P. disciformis* [ibid., vii, p. 427]. Bondar identified the *Leptosphaeria* stage of the disease as *L. citricola*, described from Italy without any mention, however, of the striking areolate lesions typical of the South American disorder. The latter is therefore attributed to a new species of *Leptosphaeria* as described above.

Bliss (D. E.). **The relation of Penicillium vermoeseni to a disease of ornamental Palms.**—Abs. in *Phytopathology*, xxv, 9, p. 896, 1935.

Penicillium vermoeseni Biourge (*P. roseum* group) [cf. *R.A.M.*, xi, p. 30; xiii, p. 181] has been isolated from *Phoenix canariensis*, *Washingtonia filifera*, and *Cocos plumosa* suffering, respectively, from leaf-base rot, bud rot, and trunk canker in southern California. Inoculation and re-isolation experiments with the cultures from these plants and one from date palm (*P. dactylifera*) proved their pathogenicity to their respective hosts, while cross-inoculations with cultures from *P. canariensis* on *W. filifera* and *C. plumosa* showed the various strains of the fungus to be similar in pathogenicity and of about equal virulence. In the case of *P. canariensis* death was found to be caused by the successive decay of the leaf bases from the oldest to the youngest; in that of *W. filifera* to the infection by the mycelium of the young, tightly folded leaves in the bud; and in that of *C. plumosa* to the weakening and breaking of the trunk.

Carneiro (J. G.). **A 'mancha do olho pardo' da folha do Cafeeiro.** [The 'grey eye spot' of the Coffee leaf.]—*Rev. Inst. Café Estac. S. Paulo*, x, 104, pp. 1893–1895, 3 figs., 1935.

A popular note, supplemented by a description of the causal organism, is given of the leaf spot of coffee caused by *Cercospora coffeicola* in San Paulo, Brazil [*R.A.M.*, x, p. 659], where the disease (of little practical importance) was first reported in 1901.

Hansford (C. G.). **Black arm disease in Uganda.**—*E. Afr. agric. J.*, i, 2, pp. 131–134, 1935.

This is a précis of the author's recent account of the cotton black-arm disease [*Bacterium malvacearum*: *R.A.M.*, xiv, p. 97] in Uganda.

Murata (M.). **Studies on the fish-net preservatives. I–III.**—*J. Soc. chem. Ind., Japan*, xxxviii, 8, pp. 425 B–430 B, 3 diags., 4 graphs, 1935.

Cotton and Manila hemp twines treated with various preservatives were affixed to iron frames and immersed in sea water for 280 days [cf. *R.A.M.*, vii, p. 514]. The tensile strength of each sample was measured ten times and the antiseptic action of the preservatives compared by calculating the mean of eight values, omitting the maximum and minimum. It was found that mixtures of coal tar with 5 per cent. by weight of copper sulphate, lead monoxide, malenite [ibid., xi, p. 14], and copper oleate were superior to coal tar alone. Treatment with a 20 per cent. copper oleate solution in Black Shell gasoline proved very effective in the earlier stages of the test, but considerable loss of weight followed and this method is therefore suitable only where very light

material is required. The coal-tar and copper compound treatment causes a temporary decrease, persisting for some four months, in the strength of the nets to about 85 per cent. of the original, succeeded by an increase to the former standard of tensile capacity.

Gregory (P. H.). **The parasitic activity of the ringworm fungi.**—*Trans. St. John's Hosp. derm. Soc., Lond., 1935*, pp. 56–65, 1935.

In this paper the author points out that the invasion of the horny tissues of the skin by the ringworm fungi is made possible by the keratolytic properties of the group. A keratinase has not been isolated from any representative of the latter, but circumstantial evidence of its existence is found in the ability of the fungi (e.g., *Microsporon felineum*) [see next abstract] to make channels or rounded pits in the keratin of the hair or nail. But whatever enzyme is responsible, it is evidently non-specific in its activity, so that the restriction of certain fungi to a given host or parts thereof (e.g., the restriction of *M. audouini* and *M. felineum* to the hair of children though capable of eroding that of adults, and the limitation of attack by *Trichophyton interdigitale* to the glabrous skin though the fungus can infect hair) must be due to an inherent immunity of local origin, attributable in its turn to a delicate balance of local factors. Further elucidation of the problem of local immunity will necessitate studies on the physiology of the fungus in relation to its environment, and with a better understanding of the local factors at stake it may be possible to disturb their equilibrium to the disadvantage of the parasite concerned.

Catanei (A.). **Huit nouvelles observations algériennes de microsporie.** [Eight new Algerian observations on microsporosis.]—*Arch. Inst. Pasteur Algér.*, xiii, 2, pp. 216–218, 1935.

Microsporosis is stated to be of extremely rare occurrence in the Mediterranean basin in general and in Algeria in particular [*R.A.M.*, xiii, p. 577], so that the recent detection in the latter country of eight fresh cases in children between 6 and 11 years old due to *Microsporon felineum* [*R.A.M.*, xv, p. 21] is of interest.

Catanei (A.). **La résistance aux réinfections dans les teignes (étude expérimentale).** [Resistance to reinfection in ringworms (experimental study).]—*Arch. Inst. Pasteur Algér.*, xiii, 2, pp. 219–232, 1 pl., 1 graph, 1935.

Experiments were conducted with *Trichophyton asteroides* (*Ctenomyces* [*T.*] *mentagrophytes*) [*R.A.M.*, x, p. 243; xiv, p. 759] to determine the nature of resistance in guinea-pigs to reinfection by ringworm. It was shown that reinoculation with the fungus within 15 months of a previous infection gave positive results only in a small proportion of cases (5 out of 39). Resistance was associated with an allergic reaction of the von Pirquet type at the site of inoculation. Similar results can be obtained by the application to the skin or intradermal injection of culture filtrates or killed cultures of the pathogen. The allergic reaction is an index of the degree of resistance possessed by a given animal and as such is subject to individual variations.

STÜHMER (A.). **Die praktische Bedeutung der Epidermophytien.** [The practical significance of the epidermophytoses.]—*Arch. Derm. Syph., Berl.*, clxxii (*KongrBer.*), pp. 120–125, 1 graph, 1935.

The alleged steady and very appreciable increase in the incidence of dermatomycoses associated with *Epidermophyton* and *Trichophyton* spp. in the Freiburg district of Germany, supported by similar observations by P. W. Schmidt in Westphalia [*R.A.M.*, xiii, p. 237], is discussed principally from the clinical standpoint [cf. next abstract]. During the period from 1st April to 1st September, 1934, the writer dealt with 138 such cases, representing 5 and 16 per cent. of all disorders among his panel and private patients, respectively. Infection is largely confined to young people (20 to 25 years) of athletic tastes in the upper ranks of society, and the hands appear to be the primary focus of attack. The importance of studies in the diagnosis of the fungi concerned is emphasized, and prophylactic measures are briefly indicated.

HILGERMANN (MARIA). **Schimmelpilzerkrankungen des Menschen und ihre Therapie.** [Human diseases caused by moulds and their cure.] —*Arch. Derm. Syph., Berl.*, clxxi, 6, pp. 593–609, 1935.

Clinical experience in Germany has convinced the writer that moulds such as *Penicillium*, *Mucor*, and *Aspergillus* spp. are greatly underrated as sources of human disorders [cf. *R.A.M.*, xv, p. 20], including chronic eczema, excellent and permanent control of which is stated to have been obtained by the use of autovaccines, a method applicable also to the various groups of dermatomycoses.

OOMEN (H. A. P. C.). **Über Cephalosporium ballagii nov. spec.** [On *Cephalosporium ballagii* nov. spec.]—*Zbl. Bakt.*, Abt. 1 (*Orig.*), cxxxiv, 7–8, pp. 475–477, 2 figs., 1935.

The organism isolated from a case of nodular lymphangitis at Budapest [*R.A.M.*, xii, p. 289] and referred by Ballagi to *Acremonium* was submitted to the writer for further examination and found to be a hitherto unknown species of *Cephalosporium*, which is named *C. ballagi* n.sp. [with Latin and German diagnoses]. On beerwort, nutromalt, and Sabouraud's agars the colonies are smooth at first, becoming tortuously furcate, flesh- to salmon-coloured (orange to light brown on the under side), with a dense, floury, pale salmon efflorescence. The sterile hyphae are sparsely branched, septate, 1 to 2·5 μ in thickness; the simple or branched conidiophores, tapering towards the apex and sometimes showing a slight tendency to verticil formation, measure 15 to 35 by 1 to 2 μ (at the base) and bear globular, highly refringent heads, 7 to 26 μ in diameter, composed of hyaline, oval or ellipsoid conidia, 4 to 8·6 by 2 to 3·7 μ (mostly 6 by 2·7 μ).

SZATHMÁRY (S.). **Infektion mit Achorion gypseum im Anschluss an eine Verletzung.** [Infection with *Achorion gypseum* following an injury.] —*Derm. Wschr.*, ci, 39, pp. 1217–1218, 1935.

Following some introductory observations on the development of the dermatophytes, the writer gives brief clinical details of infection by *Achorion gypseum* [*R.A.M.*, xiii, pp. 237, 768] as a sequel to an

injury to the arm of an 18-year-old girl in Hungary. In this connexion mention is further made of the isolation from the arm of a 16-year-old boy suffering from lupus vulgaris of an *Epidermophyton* alleged to be new to science and named [without a diagnosis] *E. gypseum flavum.*

BERESINA (Mme P. F.). **Ein Fall von generalisiertem Favus mit Erkrankung der inneren Organe.** [A case of generalized favus involving the internal organs.]—*Arch. Derm. Syph., Berl.*, clxxi, 6, pp. 590–592, 1935.

Clinical details are given of a fatal case of generalized favus due to *Achorion schoenleini* [*R.A.M.*, xiv, p. 169] in an eight-year-old boy at Tashkent, U.S.S.R., the large, double-contoured spores of the fungus being isolated from scales from the head and body, nail parings, and the intestinal tract.

REDAELLI (P.) & CIFERRI (R.). **Pouvoir pathogène pour les animaux des algues coprophytes achloriques du genre Prototheca. Observations sur les Protothecaceae.** [Pathogenicity to animals of the achloric coprophytic algae of the genus *Prototheca*. Observations on the Protothecaceae.]—*Boll. Sez. ital. Soc. int. Microbiol.*, vii, 8–9, pp. 316–321, 1935.

Two algae isolated from the stools of patients suffering from sprue in Porto Rico were provisionally identified as yeasts near to *Schizosaccharomyces* [*R.A.M.*, xiii, p. 579], but upon comparison with *Prototheca zopfii* were found to be congeneric with this species and named *P. portoricensis* and *P. portoricensis* var. *trispora* [without Latin diagnoses; see next abstract]. The authors consider that *Eomyces crieanus* is also a *Prototheca*, probably close to *P. moriformis* and *P. portoricensis*, and accordingly transfer it to this genus as *P. crieana* n.comb.

The genus *Schizosphaeromyces* Alexieff is much nearer to the Protothecaceae than to *Schizosaccharomyces*. The three coprophytic species of *Schizosphaeromyces* described by the Russian author, *S. glutinosus*, *S. coprocola*, and *S. metachromaticus*, consist of spherical cells mostly provided with a thick, mucilaginous sheath; they are uni- or multiseptate and form tetrads or more numerous groups. Repeated cleavage of the cytoplasm causes the formation of small, uninuclear islands which become differentiated into uninuclear spores with a true membrane.

Subcutaneous and peritoneal inoculations of guinea-pigs with *P. portoricensis* and *P. portoricensis* var. *trispora* produced temporary lesions which the authors regard as definitely associated with a pathogenic action on the part of the algae.

REDAELLI (P.) & CIFERRI (R.). **Une nouvelle hypothèse sur la nature du Blastocystis hominis.** [A new hypothesis as to the nature of *Blastocystis hominis*.]—*Boll. Sez. ital. Soc. int. Microbiol.*, vii, 8–9, pp. 321–325, 1935.

In this paper the authors discuss the reasons which lead them to consider that *Blastocystis hominis* [*R.A.M.*, xii, p. 508] is an achlorophyllaceous alga very near the genus *Prototheca* [see preceding abstract], and that the genus *Blastocystis* can be included in the Protothecaceae

beside the three achlorophyllaceous genera at present contained in the order.

B. hominis produces 10 to 64 endospores, whereas the Saccharomycetes and the Endomycetes produce only a limited number of spores. The central body found in *Blastocystis* does not occur in the Saccharomycetes though nearly all the green algae possess a polymorphous chromatophore which in some genera resembles the central body of *Blastocystis*; it is a very variable cytoplasmic structure. The formation found in the Volvacineae and Palmellaceae is very closely analogous to that observed in *Blastocystis*. The yeasts seldom show any formation analogous to the mucilaginous capsule that surrounds the cysts in *Blastocystis*, whereas mucilage production is very common among algae. In the Saccharomycetes the protoplasm shows abundant, complex granulations, but in *Blastocystis* and the green algae these are comparatively rare.

In *Blastocystis* an initial stage of cleavage of the cytoplasm may cause a temporary segregation of plurinucleate masses, which through successive cleavages give rise to mononuclear elements; these become individualized, being surrounded with a membrane. The yeasts show nothing corresponding to this, but the same progressive cleavage of autospores is found in some algae and *Prototheca*. Furthermore, resistant stages (chlamydospores, hypnospores, &c.), are nearly always present in sporogenous and asporogenous yeasts but are never found in *Blastocystis*.

Blastocystis and the achlorophyllaceous Chlorophyceae *P. portoricensis* and *P. portoricensis* var. *trispora* have all been isolated from the human intestine; *Chlorella variegata*, a green member of the Chlorophyceae, can also live in the same habitat and give rise to achlorophyllaceous strains identifiable with species of *Prototheca*.

Finally, the authors' observations do not show that true multiplication by scission as seen in *Schizosaccharomyces* ever occurs in *Blastocystis*, in which reproduction takes place only by means of endospores. The endosporulated cysts or cystoids and the endospores or secondary cysts found in *Blastocystis* should be termed aplanospores and autospores, respectively.

PUNTONI (V.). **'Proteomyces infestans Moses e Vianna, 1913' e suoi rapporti col genere 'Trichosporon Behrend, 1890'.** [*Proteomyces infestans* Moses & Vianna 1913 and its relations with the genus *Trichosporon* Behrend 1890.]—*R.C. Accad. Lincei*, xxii, 5–6, pp. 271–273, 1935.

The genus *Proteomyces*, founded by Moses and Vianna in 1913 (*Mem. Inst. Osw. Cruz*, v, p. 192), with the type species *P. infestans* [*R.A.M.*, xiii, p. 234], has been accepted by Ciferri and other mycologists, in whose views, however, the writer cannot altogether concur. He agrees with Ciferri on the following points: the absence of true endospores in *P. infestans*, the bodies so interpreted in the first instance being incipient arthrospores; the existence of two modes of reproduction —by arthrospores and blastospores; and the systematic position of the organism among the arthrosporous and blastosporous fungi represented, respectively, by *Geotrichoides* and *Mycotorula*. A comparison of *P.*

infestans with various characteristic species of *Trichosporon*, such as *T. beigeli* [ibid., xv, p. 20], *T. giganteum* [ibid., xii, p. 444], and *T. rugosum* revealed striking morphological and cultural parallels, including mycelial habit of growth, hyphal disintegration into arthrospores, blastospores, or small chains consisting of both elements mixed, chlamydospore and coremium production, the definitely cerebroid aspect of the whitish-yellow, later brownish colonies on Sabouraud's medium, pellicle formation on liquid substrata, and restricted proteolytic activity. In the writer's opinion *Proteomyces* and *Trichosporon* are identical, the latter name being recommended for retention on grounds of priority, so that *P. infestans* becomes *T. infestans* (Moses et Vianna) Puntoni. Verona and Nannizzi would also rank *Geotrichoides* [ibid., xiii, p. 767] as a synonym of *Trichosporon* [ibid., xiv, p. 170], but this proposal is disputed by the writer on the grounds both of the absence of true arthrospores and the creamy consistency of the colonies, which indicate that its place, at any rate for the present, is among the Torulopsidaceae-Mycotoruleae [cf. ibid., xiii, p. 635 *et passim*].

Benham (Rhoda W.). **The terminology of the Cryptococci with a note on Cryptococcus mollis.**—*Mycologia*, xxvii, 5, pp. 496–502, 2 figs., 1935.

The author gives a brief historical discussion of the usage followed by various authors in naming the fungal yeast-like forms which were placed in the genus *Torula* by Turpin in 1838 and in the genus *Cryptococcus* by Kützing in 1833, which has led to a regrettable confusion in the nomenclature, especially of the forms pathogenic to man and to animals. The terms *Torulopsis* and *Eutorulopsis* suggested by Ciferri in 1925 [*R.A.M.*, v, p. 229] have not been uniformly accepted, the majority of medical writers preferring the usage suggested by Castellani (*Arch. Derm. Syph., Chicago*, xvi, p. 383, 1927) of *Cryptococcus* for the pathogenic and *Torula* for the non-pathogenic forms. In a recent paper [*R.A.M.*, xiii, p. 162], however, he refers to *C. hominis* as *Torulopsis hominis* [*T. neoformans*: ibid., xv, p. 20], the latter generic name being also preferred by Lodder [Giordano, and Redaelli: ibid., xiv, pp. 193, 694, 758]. The objection that Kützing considered his *C. mollis* an alga is not tenable as an examination of his herbarium material showed definitely that it was not an alga but a yeast-like fungus, similar to the forms which have since been called *Cryptococcus*, *Torula*, *Eutorula*, and *Torulopsis*. Besides being commonly used in medical literature, *Cryptococcus* has priority over the other three genera, the last two of which have no wide currency. The name *Torula* was also given in 1801 by Persoon to a dematious fungus, not of this group.

It is suggested that Vuillemin's definition of the genus *Cryptococcus* should be emended somewhat as follows: unicellular fungi consisting of round or ovoid cells occasionally in chains but never forming a well-defined mycelium; reproduction by one or more buds, without ascospores; growth on artificial media in pasty or dry colonies, white or coloured. The other generic names should be discarded as synonymous with *Cryptococcus*. It is further proposed, since the identity of *C. mollis* is uncertain, to recognize *C. hominis* Vuillemin as the representative species of the genus, with the following brief description: cells

round to oval, 3 to 8 (usually 4 to 5 μ) in diameter; contents granular with lipoid globules, wall distinct and surrounded by a clear zone of capsular substance; giant colonies circular with a smooth glistening surface and mucoid consistency, white, tan, or deep brown.

FERRARIS (T.). **Parassiti vegetali della Canapa.** [Plant parasites of Hemp.]—*Riv. agric., Roma*, xxxi, 715, pp. 336–337, 1935.

Brief, practical notes are given designed to assist growers in the identification and control of the following hemp [*Cannabis sativa*] diseases occurring in Italy, viz., *Pseudoperonospora cannabina*, *Sclerotinia libertiana* [*S. sclerotiorum*: *R.A.M.*, vii, p. 299; xi, p. 652], *Dendrophoma marconii* [cf. ibid., xiii, p. 377], and *Septoria cannabis* [ibid., iv, p. 398; xiii, p. 215].

P. cannabina produces a yellow discoloration of the leaf, which becomes contorted and withered; ashen-grey conidiophores are present on the lower surface under the spots. The disease, which is often associated with infestation by the eelworm *Tylenchus devastatrix* [*Anguillulina dipsaci*], seldom occurs on a large scale; control consists in spraying with a 1 per cent. copper mixture and destroying diseased leaves found on the ground.

S. sclerotiorum produces a black discoloration at the base of the stems, which near soil level become covered with a white cottony mould gradually penetrating to the medulla. Affected stems are weak, fragile, and finally wither. Control consists in decreasing organic and increasing inorganic soil dressings, especially phosphates, thinning out the plants and removing and destroying the affected ones.

D. marconii, though seldom causing appreciable loss, is prevalent on hemp in some parts of Italy. Ashy, oval, sparse or isolated, occasionally confluent spots measuring 1 to 1·5 by 0·2 to 0·8 cm., elongated in the direction of the fibres, appear on the stalks, especially near the base of the stem. If infection is serious, the crop should be harvested early.

The commonest hemp disease in Italy is the leaf blight due to *S. cannabis*. In summer the leaves of affected plants, especially the lowest ones, show round, whitish, or ochraceous-yellow lesions with a dark border, and such leaves are liable to become curled and withered up towards the edges and to fall prematurely, leaving much of the lower part of the stem defoliated. If the upper leaves also become affected growth is seriously endangered and the yield may be much reduced. In districts where the disease is liable to occur the crop should be sprayed with a 1 per cent. copper mixture at the end of June or during the first half of July, and all withered leaves found on the ground should be burnt.

SMITH (K. M.). **Colour changes in Wallflowers and Stocks.**—*Gdnrs' Chron.*, xcviii, 2537, p. 112, 2 figs., 1935.

Wallflowers of the popular blood-red variety are stated to have recently developed an unsightly yellow flecking or 'break' in the colour of the flower, sometimes accompanied by leaf-mottling, which experiments at Cambridge showed to be due to the newly detected *Brassica* virus [*R.A.M.*, xiv, p. 669], the infective principle being conveyed to the flowers from the neighbouring cruciferous vegetables by *Myzus*

persicae. A similar but more serious disturbance, also caused by the *Brassica* virus, has been found to affect Brompton and Ten-weeks stocks [*Matthiola incana,* and its var. *annua,* respectively], the leaves of which become severely mottled and distorted while the flowers of pink varieties show a banding of white or darker pink. *Arabis* sp. and *Hesperis matronalis* are likewise subject to infection by the same virus, the leaves of the former showing profuse mottling and ring-like markings of darker green, while those of the latter develop dark green patches of the mosaic type, crinkling, and yellowing, accompanied by severe crippling of the plant. Control measures are briefly indicated.

McWhorter (F. P.). **Occurrence of Fusarium wilt of China Aster in Oregon.**—*Plant Dis. Reptr,* xix, 15, p. 246, 1935. [Mimeographed.]

During the past five years diseased asters [*Callistephus chinensis*] suspected of *Fusarium* wilt [*R.A.M.*, xv, p. 23] in Oregon have uniformly been found infected by a destructive virus, without any trace of the fungus being present. The latter, however, has recently been detected in a Corvallis garden, possibly as a sequel to the abnormally warm summer of 1935.

Ferraris (T.). **La 'cancrena pedale' del Geranio.** [Foot rot of Pelargoniums.]—*Riv. agric., Roma,* xxxi, 716, pp. 356–357, 1935.

Potted pelargoniums in Italy are commonly liable to a basal foot rot caused by *Sclerotinia libertiana* [*S. sclerotiorum*]. Plants infected during the vegetative season develop a yellow discoloration of the leaves; those at the base wilt, curl up, and fall, while those higher up remain attached to the plant longer, but do not increase in size. Few new shoots appear, and those that do form are chlorotic. The blossoms are few and small, and quickly fall. The base of the stem is blackened and growth occurs only in the green part, where the leaves and flowers at the ends of the shoots remain alive for a short time. The root system is disintegrated.

Prevention consists in the use of a suitable potting mould and careful watering. Slightly affected plants may be treated by washing the soil from the roots, cutting off the affected parts, dipping the plants for a few minutes in a 1 to 2 per cent. iron sulphate solution and carefully repotting in light soil. The writer obtained excellent control, even with severely diseased plants, by the application of the Caffaro ferfort fertilizer at the rate of 25 to 50 gm. per pot.

Flachs (K.). **Orchideenwelke.** [Orchid wilt.]—*Nachr. SchädlBekämpf., Leverkusen,* x, 3, pp. 129–137, 10 figs., 1935. [English and French summaries.]

Losses amounting to M. 10,000 are stated to have been caused in the orchid stands of the Munich Botanical Garden in 1934 by a wilt disease, generally spreading upwards from the stem base and consistently associated with the presence of a yellowish, flocculent mycelium composed of hyaline hyphae, 2 to 7·5 μ in diameter, with frequent clamp-connexions, and of dark-brown sclerotia, 1 mm. in diameter (2 to 3 mm. on boiled potato slices). The fungus grew on a variety of standard media (excluding meat broth), its development being most

profuse on carrot slices. The optimum temperature for growth was found to lie between 26° and 30° C. and the optimum humidity between 80 and 90 per cent.; at 6° to 18° and again above 30° development was scanty and it ceased entirely at 40°; neither the mycelium nor the sclerotia, however, were destroyed by exposure to temperatures several degrees below zero. The organism, which was identified as *Sclerotium rolfsii*, its taxonomic position and distribution being briefly discussed, was found to be capable of infecting a number of ornamentals besides orchids, e.g., *Polypodium*, *Platyceria*, and *Ficus* spp., *Victoria regia*, cineraria [*Senecio cruentus*], hydrangea, begonia, and azalea [*Rhododendron*]. Excellent control of the disease was obtained by the immersion of the underground portions of the plants for 15 minutes in a 0·5 per cent. solution of ceresan nassbeize and by repeated sprinkling of the plants and soil with the same preparation at 0·25 per cent.

GUTERMAN (C. E. F.). **Diseases of Iris.**—Ex *Ext. Bull. Cornell agric. Exp. Sta.* 324, pp. 26–34, 3 figs., 1935.

Popular notes are given on the symptoms, etiology, and control of the following diseases affecting irises in the United States: leaf spot (*Didymellina macrospora*) with its conidial stage, *Heterosporium gracile* [*R.A.M.*, iv, p. 707; xiv, p. 698], bacterial soft rot (*Erwinia carotovora*) [*Bacillus carotovorus*: loc. cit.], crown rot (*Sclerotium delphinii*) [ibid., xv, p. 24], rhizome rot (*Botrytis convoluta*) [ibid., xii, p. 293], rust (*Puccinia iridis*) [ibid., xiv, p. 698], and mosaic [ibid., xiii, p. 380].

GUTERMAN (C. E. F.). **Peony diseases.**—Ex *Ext. Bull. Cornell agric. Exp. Sta.* 321, pp. 32–43, 6 figs., 1935.

Popular notes are given on the symptoms, etiology, and control of the following diseases affecting peonies in the United States: the very prevalent and destructive blight caused by *Botrytis paeoniae* [*R.A.M.*, xiii, p. 460; xiv, p. 15], a somewhat similar but less common disease due to *Phytophthora paeoniae* [ibid., ix, p. 809; xiii, p. 445], stem rot (*Sclerotinia sclerotiorum*), wilt (two species of *Verticillium*) [*V. dahliae*: ibid., vii, p. 752 and (?) *V. albo-atrum*], miscellaneous foliar disorders associated with *Cladosporium* [*paeoniae*: ibid., viii, p. 293], *Septoria paeoniae* [ibid., xii, p. 205], *Cercospora* [*paeoniae*: ibid., v, p. 252], *Phyllosticta* [*paeoniae*: ibid., iii, p. 138], and *Alternaria* [ibid., iii, p. 139], mosaic [ibid., iii, p. 138; xiii, p. 151; cf. also xiv, p. 199], crown elongation [ibid., vii, p. 516], and Lemoine's disease [ibid., xiii, p. 445].

GREEN (D. E.). **A suspected virus disease of Paeonies new to Great Britain.**—*Gdnrs' Chron.*, xcviii, 2543, p. 213, 1 fig., 1935.

Peony leaves received for examination at the Royal Horticultural Society's Laboratory, Wisley, bore pale spots surrounded by well-marked concentric rings of light-coloured tissue, covering most of the surface. The material was forwarded to Dr. K. Smith, of the Virus Research Station, Cambridge, who considers the symptoms to be identical with those of peony ring spot in France [*R.A.M.*, xiv, p. 199], while a resemblance to the ring spot affecting the flower in the United States [ibid., ix, p. 629] is also indicated.

Harrison (A. L.). **The perfect stage of Phomopsis stewartii on Cosmos.**—*Mycologia*, xxvii, 5, pp. 521–526, 1 pl., 1935.

The stem blight of *Cosmos bipinnatus* caused by *Phomopsis stewartii* [*R.A.M.*, ii, p. 261] affected as many as 50 per cent. of the *Cosmos* plantings at the Geneva (New York) Experiment Station in 1934. The disease, which chiefly attacks plants at approximately the blooming stage or those weakened by other parasites, is characterized by dark brown, rapidly enlarging lesions, usually at the nodes of the main stem or branches, which are finally girdled. Material collected in the autumn of 1932, when placed the following spring in a moist chamber, produced after approximately five weeks a perithecial fungus which proved to be a new species of *Diaporthe* intermediate between *D. phaseolorum* and *D. arctii* [ibid., xiii, p. 270], and is named *D. stewartii*, with an English diagnosis. The perithecia are single, scattered, embedded under the pycnidial stromata, globose to lenticular, black, and 308 to 600 by 252 to 420 μ in diameter. The beaks are 1 to 1·5 mm. (rarely 2 mm.) long, tapering or filiform, and slightly hairy. The asci are sessile, elongate-clavate, 25·1 to 42·9 by 3·9 to 7·3 μ (average 31·7 to 37·6 by 4·6 to 5·9 μ) in diameter, with thickened apex, and evanescent paraphyses. The ascospores are distichous, ellipsoidal to fusoid, occasionally slightly curved, two-celled, and 9·2 to 17·2 by 1·3 to 3·3 μ (average 10·6 to 13·2 by 2 to 2·5 μ). The perithecia have not been observed in the field; in pure culture they were obtained only in one series on sterilized *Cosmos* stems.

The pathogenicity of both stages was demonstrated in the greenhouse, and the fungus was reisolated from the inoculated plants. Infection resulted from 90 per cent. of the inoculations made on plants in bloom or in a weakened condition, and from only 10 per cent. of those on young and vigorous plants. The incubation period and latent infection lasted from about two days to several weeks, depending on the age, size, and vigour of the plants.

Davis (W. H.). **Twig blight of the American Bladder Nut caused by Hypomyces ipomoeae.**—*Mycologia*, xxvii, 5, pp. 527–542, 3 figs., 1935.

This is a full account of the twig blight of the American bladder nut (*Staphylea trifolia*) caused by *Hypomyces ipomoeae* in the United States, a summary of which has already been noticed from another source [*R.A.M.*, xiii, p. 410].

Raabe (A.) & v. Sengbusch (R.). **Züchterisch wichtige Beobachtungen an einigen Lupinenarten. Die Empfindlichkeit von Lupinus luteus, Lupinus angustifolius, Lupinus albus und Lupinus mutabilis gegen Frost und Kalk und ihre Anfälligkeit gegen Meltau und Welke.** [Genetically important observations on some Lupin species. The susceptibility of *Lupinus luteus*, *Lupinus angustifolius*, *Lupinus albus*, and *Lupinus mutabilis* to frost and lime and their liability to mildew and wilting.]—*Züchter*, vii, 9, pp. 244–248, 5 figs., 1 graph, 1935.

In 1934 the German lupin crop suffered extensively from mildew [*Erysiphe polygoni*: *R.A.M.*, vi, p. 732], *Lupinus mutabilis* being the

only variety to show any degree of resistance, probably due to physiological factors.

Thielavia [*Thielaviopsis*] *basicola* [ibid., vi, p. 731; x, p. 293] and *Rhizoctonia* [*Corticium*] *solani* [ibid., iii, p. 722; viii, p. 235] were found on the roots of lupin plants affected by wilting. Inoculation experiments in the laboratory with the former pathogen, either by smearing the rootlets of seedlings with spores from a pure culture or by dipping them in a conidial suspension, gavē positive results on *L. luteus*, *L. angustifolius*, *L. albus*, and *L. mutabilis*; under field conditions, however, the last-named is characterized by an exceptional capacity for resistance (only 0·8 per cent. infection compared with 96, 28·6, and 4·3 per cent. for *L. angustifolius*, *L. albus*, and *L. luteus*, respectively). Similar tests with *C. solani* sclerotia gave inconclusive results. Though *T. basicola* is a destructive parasite of lupin seedlings, the authors consider that it is only of secondary importance in the case of older plants, and the same is probably true of *C. solani*. The frequent absence in diseased material of any trace of a fungus, together with the occurrence of brown or brownish-purple stem discolorations, is suggestive of the stripe disease of Leguminosae, attributed in some quarters to *Bacillus lathyri* [ibid., xiv, p. 734] and in others to a virus [ibid., xiv, p. 108], the latter evidently being implicated in the causation of a similar disturbance of lupins in New Zealand [ibid., xv, p. 28; see also next abstract].

Köhler (E.). **Übertragungsversuche mit dem Virus der Lupinenbräune.** [Transmission experiments with the Lupin browning virus.]—*Angew. Bot.*, xvii, 5, pp. 277–286, 6 figs., 1935.

A tabulated account is given of the writer's experiments in the transmission of the lupin 'browning' virus (either crude or in dilutions up to 1 in 10,000), the agent of a disease in Germany apparently identical with 'sore shin' in New Zealand [see preceding abstract]. Most of the inoculations were made with Samuel's glass spatula [*R.A.M.*, xv, p. 41], but the needle-prick and rubbing methods were also used. The virus was transmitted from naturally infected *Lupinus angustifolius* and *L. luteus* to *L. angustifolius* and Samsun tobacco, and to all these hosts from artificially infected individuals. The outcome of inoculations on tobacco from *L. angustifolius* was more variable than from tobacco to tobacco, as was also in an even higher degree that of tests on lupin with the virus from tobacco, *L. luteus* being apparently less susceptible than *L. angustifolius*.

The lupin virus is readily influenced by external conditions, succumbing to ten minutes' heating between 50° and 60° C. but surviving two hours' standing in juice. Under laboratory conditions two types of the virus are distinguishable, namely, a relatively weak 'green' type, the attributes of which have persisted through many successive transfers to tobacco, and a virulent 'chlor' type, from which the 'green' is regularly isolated in dilution series, whereas 'green' apparently never reverts to 'chlor'. It is questionable whether these differences exist in the field.

After an incubation period of three weeks inoculated lupins showed chlorosis of the shoot tips and curtailment of the petioles of the apical leaves and topmost internodes. Black spots developed on the upper

and under sides, the pinnae tended strongly to roll and were liable to fall, and the leaves bent downwards. The upper third of the stem turned brown, the discoloration eventually spreading downwards, the lower leaves lost their pinnae, and the plants died prematurely.

Tobacco plants inoculated with crude or slightly diluted virus developed chlorosis and (under certain conditions of temperature and illumination) ring spot-like symptoms, accentuated in the case of marked variations of temperature into a so-called 'quercina' pattern. The upper leaves show a peculiar spotted mosaic not hitherto observed by the writer, while the lower ones subsequently develop a fine network of mottling. Diseased plants are distinctly stunted.

Data obtained as the paper was going to press indicate that the lupin virus is in all probability identical with the yellow mottle (virus 1) of cucumber [ibid., xiv, p. 811]. Transmission tests on the latter host gave positive results and the symptoms developing on the foliage agreed with those described and figured by Ainsworth in England.

TAKIMOTO (S.). **Phytophthorose of Buckwheat.**—*Bult. sci. Fak. terk. Kjuŝu Univ.*, vi, 2, pp. 105–110, 1 pl., 1935. [Japanese, with English summary.]

Phytophthora fagopyri n.sp. [a diagnosis of which is given in Japanese: *R.A.M.*, xv, p. 58] is stated to attack the roots of buckwheat and those parts of the stems that are near the soil surface, besides causing slight infection of ripe tomato fruits and bean seedlings. The affected parts contain oospores but no conidia. In culture conidia are produced on all media, and oospores on oatmeal agar.

DIEHL (W. W.). **Diplodina graminea Sacc. in South Carolina.**—*Plant Dis. Reptr*, xix, 15, p. 246, 1935. [Mimeographed.]

A little known fungus, provisionally referred to *Diplodina graminea* Sacc., which was originally reported from Italy and has not hitherto been observed in the United States, was detected on *Cynodon dactylon* in South Carolina in August, 1935. The pycnospores of the American material are slightly smaller than those described by Saccardo (11 to 13 by 4 to 5 as against 15 to 16 by 5 to 7 μ), but this difference is not regarded as specifically significant.

BRIEN (R. M.). **Three fungi causing 'brown-patch' of lawns in New Zealand.**—*N.Z. J. Agric.*, li, 3, pp. 157–159, 1 fig., 1935.

The author states that for a number of years bowling and golf greens and lawns in various parts of New Zealand have been affected with a condition locally known as 'brown patch' [cf. above, p. 74]; this is chiefly associated with three fungi, namely, *Sclerotinia trifoliorum* [*R.A.M.*, xiv, p. 315], which causes the development in turf of small, circular patches, 6 to 8 in. in diameter, at first yellow, later brown, and finally dying out, and which was isolated several times; *Corticium vagum* [*C. solani*: ibid., xiv, p. 240]; and *C. fuciforme* [ibid., xiv, p. 588]. On greens affected with any one of these fungi the condition was successfully controlled by applications of 3 oz. mercuric chloride in 50 galls. water, this quantity being sufficient to treat 2,000 sq. ft. of lawn.

Hildebrand (E. M.). **Silver leaf on fruit trees in New York.**—*Plant Dis. Reptr*, xix, 14, p. 236, 1935. [Mimeographed.]

On 5th June an unusual outbreak of silver leaf (*Stereum purpureum*) [*R.A.M.*, vi, p. 400; xiii, p. 493] was observed in Orleans County, New York, in an orchard of 440 Montmorency cherry trees, of which 65 were found to be definitely diseased and 25 showed doubtful symptoms when re-examined on 26th July. The majority of cases occurred on the north side of the orchard, indicating a possible correlation between infection and exposure. In five instances the symptoms were generalized, but as a rule they tended to be laterally or centrally localized.

Pratt (H. St. J.). **Fruit tree spraying in Queensland.**—*Fruit World, Melbourne*, xxxvi, 9, p. 9, 1935.

Under the Diseases in Plants Act it is compulsory to spray all deciduous fruit trees in the Stanthorpe Fruit District of Queensland during July or August (winter or dormant application) either with miscible oil, lime-sulphur [*R.A.M.*, xv, p. 37], or tar distillate. Schedules are given for appropriate fungicidal treatments against brown rot of stone fruits [*Sclerotinia fructicola*: ibid., xiv, pp. 559, 703], apple powdery mildew [*Podosphaera leucotricha*: ibid., xi, p. 519], pear black spot [scab: *Venturia pirina*], and certain other diseases.

Popova (Mme E. M.). Получение препарата пектиназы из **Botrytis cinerea** для осветления плодовых соков. [The preparation of pectinase from *Botrytis cinerea* for the clarification of fruit juices.]—*Микробиол.* [*Microbiol.*], iv, 2, pp. 247–253, 1935.

Botrytis cinerea was found to contain a pectinase [*R.A.M.*, xiii, p. 531] inducing active fermentation of apple pectin at P_H 3·4 to 3·6 and 25° to 30° C. The pectinase preparation dried at 40° can be kept for lengthy periods without deterioration; it decomposes 90 to 100 per cent. of the pectin in apple juice, complete transparency of which was thereby effected. In the case of cranberry pectin the pectinase produced by *Penicillium glaucum* showed greater fermentative activity than that of *B. cinerea*.

Esmarch (F.). **Weniger bekannte Blattfleckenkrankheiten der Birne.** [Lesser known leaf diseases of the Pear.]—*Kranke Pflanze*, xii, 9, pp. 129–132, 1 col. pl., 1935.

Popular notes are given on three comparatively unfamiliar leaf spots of pear and their control in Germany. *Mycosphaerella sentina* appears to be increasing in prevalence in Europe, judging by the severe epidemic of 1934 in Austria [*R.A.M.*, xiv, p. 771] and parts of Germany. Among the relatively few varieties resistant to this disease are Grumbkow Butter, Duchess of Angoulême, Liegels Winter Butter, Vereins-Dechants, Conference, and Bergamotte Renée. Leaf browning (*Stigmatea mespili*) [cf. ibid., iv, p. 355; xi, p. 799] causes premature defoliation of nursery stock; a high degree of resistance is shown by Clapp's Favourite, Dr. Lucius, Bonne Louise, Vereins-Dechants, Napoleon's and Liegels Butter, Duchess of Angoulême, and others. As alternate hosts of *Gymnosporangium sabinae* [ibid., xiii, pp. 316, 398,

543] are mentioned *Juniperus virginiana*, *J. oxycedrus*, *J. phoenicea*, *J. tripartita*, and *J. excelsa*.

HOETTE (SHIRLEY). **Certain aspects of investigations on black-end disease of Bananas in Australia.**—*Pamphl. Coun. sci. industr. Res. Aust.* 58, 22 pp., 3 figs., 1935.

In this detailed account of her investigations into banana black end [*R.A.M.*, xiv, p. 517] in Australia the author points out that the term has been used to denote stalk-end rots caused by different fungi. The condition appears only after ripening, the finger stalk becoming blackened and moist and the discoloration gradually spreading along the surface of the fruit for half an inch or more. It is only in very severe cases that the flesh rots, but the unsightly appearance of affected bananas reduces their market value considerably.

The chief causal organism is *Gloeosporium musarum*. It sets up a very moist form of the disease; the finger stalk readily breaks and is easily pulled off. The flesh usually becomes soft, but does not as a rule develop extensive rotting.

In a second type of black end several species of *Fusarium* are often associated with *G. musarum*, and may preponderate over the latter, though they are probably only secondary invaders. Occasionally, however, a buff-coloured species was found quite apart from the *Gloeosporium*, and evidence was obtained indicating that it can cause some development of disease.

A third type is produced by *Nigrospora musae* which causes a dry, black rot. If the fruit is kept very long the fungus penetrates the flesh which develops a soft rot. This phase ('end squirter') occurred several times in Brisbane in 1934. Infection is favoured by low temperatures, the optimum growth temperature of *N. musae* being 19° to 20° C.

In a fourth type, due to *Thielaviopsis* [*Ceratostomella*] *paradoxa*, the skin is black and very moist for a distance of nearly half the length of the fruit, which becomes covered with a white mycelium, rapidly turning greenish-black. The flesh is reduced to a semi-liquid consistency with an odour like that of an over-ripe pineapple. The rot spreads by contact, with the result that nearly all the fruit in a case may become infected.

Isolations from affected bananas seldom yield a fungus in pure culture, as so many organisms are present on the surface which gain a hold once rotting has begun. In 1934, however, several strains of *G. musarum* and *Glomerella cingulata* were obtained from black-end fruit. The strain of the former (A) most frequently isolated and proved to be the most highly pathogenic corresponds in spore size with Wardlaw's typical pathogenic form from bananas in the West Indies [ibid., xi, p. 382]. A second strain (B), isolated several times, though sometimes pathogenic, causes little damage as a rule; its spores measured 11 to 34 by 3·5 to 7·5 μ. A third strain (C), isolated only a few times, is practically non-pathogenic. Perithecia of *G. cingulata* were observed at times on affected fruit. The typical strain (A) agrees closely with Wardlaw's most common strain, the asci measuring approximately 70 by 12 μ and the ascospores 11 to 19 by 4 to 6 (average 16 by 5·5) μ.

Considerable variation was observed in subcultures of this strain and inoculations on bananas showed it to be practically non-pathogenic to them though able to infect ripe apples [ibid., xiv, p. 40]. A second strain (B) of *G. cingulata* was isolated from affected bananas on several occasions and a third (C) from perithecia on banana skins. Apart from other fungi five species of *Fusarium*, including the buff-coloured one mentioned above and one identified by Wollenweber as *F. oxysporum* (*F. cubense*) [*F. oxysporum cubense*], have been obtained from affected bananas but none appears to be strongly pathogenic to the fruit.

Inoculation experiments establishing the pathogenicity of the various organisms are described in detail. The chief difficulty found in making the tests was that numerous spores are already present on the fruit when picked. Mixed inoculations of bananas with *G. musarum* and one of the species of *Fusarium* proved to be no more pathogenic than *G. musarum* alone. No trace of any black-end organism was found in the air of the ripening rooms and it is clear that the spores are brought away on the bananas from the plantation, infection resulting under favourable conditions.

V[IÉ] (G.). **L'emploi des agents de mouillage dans les préparations antiparasitaires.** [The use of wetting agents in anti-parasitic preparations.]—*Industr. chim., Paris*, xxii, 260, p. 647, 1935.

Recent laboratory experiments are stated to have shown that the best wetting agents for incorporation in plant protectives [cf. *R.A.M.*, xiii, p. 389; xiv, p. 556] belong to a group of derivatives from turpentine essence, the terpenic alcohols, more especially terpineol. This product, which is manufactured on a commercial scale in the south-west of France (Landes), has been found to possess remarkable wetting properties due to the semi-polar grouping in its molecule. In order to stabilize terpineol in agricultural solutions it is essential to combine it with a sulphonated product, such as naphthol, sulphonate of soda, or one of the higher fatty alcohols. Terpineol will be found extremely useful in the vineyard and orchard, particularly for the dormant treatment of fruit trees, and it has also been successfully introduced into the textile industry.

HENIN (S.). **Quelques propriétés physico-chimiques concernant les liquides insecticides et anticryptogamiques.** [Some physico-chemical properties affecting insecticidal and fungicidal fluids.]—*Rev. Path. vég.*, xxii, 3, pp. 209–216, 2 figs., 1935.

The author gives explanations and describes in detail methods of measuring surface tension, wettability, viscosity, fluidity, and rigidity of liquids [cf. preceding abstract]. Wettability is taken to be the power of a drop to spread over a flat surface, and estimated by the angle made by the tangent to the edge of the drop with the horizontal. He conceives a drop of liquid to be constituted in a series of planes which slide one over the other when the drop moves. Liquids are viscous when these planes move slowly, fluid when they move rapidly, and rigid when they move only under strong differences of pressure. Rigidity is a static property never met with in pure liquids but common in solutions and suspensions.

The author points out that the attempt to find formulae representing the resultant of several of the properties may be fallacious. For example, the index of penetrability given by the ratio surface tension/viscosity, which is proportional to the rate of penetration of the liquid in a capillary tube, is inapplicable to rigid liquids. No formula expresses the effect of all five factors acting simultaneously. As regards the penetration of capillary tubes, the affinities between the groups of molecules of the liquid and those of the solid come into play but cannot be estimated, as they are insufficiently known. It is often impossible to explain or foretell the effect of a substance by measuring its physico-chemical properties, as conditions vary so widely and emulsions and spray mixtures (bouillies) are heterogeneous. In studying the properties of fluids account should be taken of properties more closely comparable with one another than those dealt with in the present paper; for example, instead of measuring wettability it might be more useful to determine the rate of spread of the drops of a spray fluid.

MEHRLICH (F. P.) & FITZPATRICK (H. M.). **Dichotomophthora portulacae, a pathogene of Portulaca oleracea.**—*Mycologia*, xxvii, 5, pp. 543–550, 3 figs., 1935.

An account is given of an apparently undescribed hyphomycetous fungus which was found epidemic on purslane (*Portulaca oleracea*), a noxious perennial weed in the Hawaiian Islands. Histological examination showed that the brown fungus hyphae, about 6 μ in diameter, are distributed intracellularly throughout all the tissues of the host. In pure culture the fungus produces a copious mycelium, hyaline at first and largely aseptate, and resembling *Rhizoctonia* in branching habit. At least two distinct strains have been recognized, one producing conidia profusely but no sclerotia on malt agar, while the other produces abundant sclerotia but conidia following desiccation only. Both strains yield abundant conidia on their natural host.

A new genus, *Dichotomophthora*, of the Phragmosporae, is created for this organism which is named *D. portulacae*, with an English specific, but no formal generic, diagnosis. It does not form either pycnidia or stromata. The conidiophores are brown, regularly dichotomously to sub-dichotomously branched, successively elongating, 75 to 280 by 5 μ in diameter. The terminal branches are 4- to 8-lobed, bearing a single terminal conidium on each lobe. The conidia are smooth, exogenous, 1- to 6-celled, brown, ovoid to elongate-ovoid, rarely curved, 15 to 56 by 6 to 13 μ. The sclerotia are abundant, minute, black outside and hyaline to grey inside, irregular in shape, and 56 to 205 by 56 to 145 μ in diameter.

GLENNIE (AGNES E.). **Index to the literature of food investigation.**—Published by Dep. sci. industr. Res., Food Invest. Board, Lond., iv, 2, iv+182 pp., 1933; v, 1, 2, viii+283 pp., 1934; vi, 1, v+309 pp., 1935; vi, 2, v pp. and 311–621, 1935.

These are further numbers of the annotated bibliography of current English and foreign publications on food research which is issued twice yearly by the Low Temperature Research Station, Cambridge [*R.A.M.*, xi, p. 734]. The first part of Volume vi contains a 15-page review of

noteworthy developments in the subject during 1932–3, and the second part of the same volume deals with works published up to 1933, inclusive. The author was assisted in the preparation of Vólume vi by Miss G. Davies.

SMITH (K. M.). **Plant viruses.**—ix+107 pp., 1 pl., 6 figs., 3 graphs, 1 diag., London, Methuen & Co., Ltd., 1935.

In this attractively presented booklet the author gives a clear and concise account of the more important characters and properties of plant viruses in the light of the most recent knowledge [cf. *R.A.M.*, xii, p. 776], with abundant references to the bibliography of 94 titles which is appended at the end. It is divided into ten chapters, namely, introductory, general technique of plant virus study, natural modes of transmission, the virus in the host, the virus outside the host, the virus in the insect vector, immunity, nature of the viruses and classification, control, and some comparisons between the plant and the animal viruses. In spite of its brevity, the book contains much information of interest and value to all those who desire to obtain a summary of the present position of knowledge of the subject.

SMITH (K. M.). **The problem of a plant virus infection.**—*Nature, Lond.*, cxxxvi, 3436, p. 395, 1935.

In further studies on the new virus disease [*R.A.M.*, xiv, p. 797] observed at Cambridge, inoculations showed that a high percentage of healthy, apparently normal White Burley tobacco plants carry the virus in the roots, while careful tests failed to demonstrate its presence in the stems and leaves of young plants, though it was isolated once or twice from the stems of old, apparently normal plants. Inoculations of White Burley tobacco plants with virus from their own roots gave severe localized symptoms. Symptoms developed naturally on tobacco seedlings in glasshouses from November until April.

A good deal of evidence was obtained that non-infectious young tobacco plants, grown in sterilized soil in an insect-proof glasshouse, may contain large quantities of the virus in the roots when tested five or six weeks later. Transmission on the seed, through the soil or in water, was shown by exhaustive tests to be unlikely, though seed transmission cannot be completely ruled out; the virus is not insect-borne. Natural infections were observed only on *Nicotiana tabacum* and, occasionally, on *N. glutinosa*, while the very susceptible cowpea, *Datura*, and tomato, though grown in glasshouses next to affected tobacco, did not once develop the disease. Three possible explanations of the problem are put forward. The virus may be present all the time in the stem, but in a non-virulent form which can become virulent only by concentrating itself in particular root cells, or in such a diluted form that a positive reaction is not obtained on inoculation. Secondly, the virus may arise spontaneously in the plant. Thirdly, an unknown mode of virus transmission may exist.

COOK (M. T.). **Host index of virus diseases of plants.**—*J. Agric. P.R.*, xix, 3, pp. 315–406, 1935.

This host index of plant virus diseases [cf. *R.A.M.*, xv, p. 40] repre-

sents an attempt to bring the first records of each disease together for the convenience of those interested in the subject. Up to the present time, virus diseases have been recorded on about 80 families, more than 400 genera, and nearly 1,000 species of plants. The authorities for the records are given in each case, and sometimes annotations are added. The host plants are arranged under the natural orders, both plants and orders being listed in alphabetical sequence.

COOK (M. T.). **Index of the vectors of virus diseases of plants.**—*J. Agric. P.R.*, xix, 3, pp. 407–420, 1935.

This index to the insect vectors of plant virus diseases is the counterpart of the previous bibliographical lists published by the author [see preceding abstract]. The insects are listed alphabetically and the authority for the record, the year of publication, and the host plants affected are cited. Originally it was intended to give first records only but some additional ones have been included.

POLLACCI (G.) & TREDICI (VINCENZINA). **Sulla germinabilità asimbiotica dei semi di Orchidee.** [On the asymbiotic germinability of Orchid seeds.]—*Boll. Soc. ital. Biol. sper.*, x, 8, pp. 695–697, 1935.

Sterilized seeds of *Cymbidium giganteum*, *Cattleya gigas*, *C. walkeriana*, *C. memoriae cogghe*, *C.* hybrid, *C. albatros mossiae*, and *Phalenopsis schielleriana* var. Grand Condé were sown in the following substrata: filtrates of one-month-old *Rhizoctonia* [? *repens*] cultures on agar at P_H 4·8 killed in an autoclave, La Garde's medium with sugar (no fungus) at P_H 4·6, filtrates of old agar cultures of a fungus isolated from *Phalenopsis* killed by heating (P_H 5·3), Burgeff's medium without a fungus (P_H 5·3), and the same with the organism from *Serapias linguae* [cf. *R.A.M.*, xi, p. 317; xii, p. 634].

The best results were obtained with *C. giganteum* in the *Rhizoctonia* and *Phalenopsis* fungus media. In the cultures with the living fungus there was a tendency for the latter to overgrow the seeds and retard protocorm formation. No germination occurred on media containing neither a living fungus nor killed filtrates. The protocorms were transferred to tubes the soil of which was moistened from time to time either with sterile water or with a nutrient solution consisting of calcium and potassium nitrates, ammonium sulphate, potassium phosphate, and magnesium sulphate. The plants receiving the latter treatment showed a slight initial acceleration of growth, but this was not maintained, and subsequently there was no apparent difference in the development of the two series.

It would appear from these preliminary researches that the germination of orchid seeds depends less on the actual symbiotic relationship between them and the fungus than on the chemical products of the latter, an observation of considerable practical as well as purely biological importance.

RICE (MABEL A.). **The cytology of host-parasite relations.**—*Bot. Rev.*, i, 9, pp. 327–354, 1 pl., 1935.

From a review of the relevant literature [73 titles of which are cited in the appended bibliography] and her own cytological studies of the

host-parasite relations in certain rusts [*R.A.M.*, vi, p. 631; xiii, p. 532], the author shows the high degree of adaptation between host and parasite which has developed in the Uredinales, possibly through adjustment and linkage of the metabolism of the fungus with that of the host, the haustoria of six rusts, including *Uromyces caryophyllinus* and *Puccinia malvacearum*, being described and figured in illustration of the degree of adjustment attained. She shows further that parasitic specialization, which is highly expressed in the rusts, is a corollary to obligateness, and believes that their high degree of specialization has been effected by the elaborate development of the haustorium.

RONSDORF (LISELOTTE). **Vergleichende Untersuchungen über die Wirkung verschiedener Wuchsstoffe auf das Wachstum einiger Pilze.** [Comparative investigations on the effect of various growth substances on the development of certain fungi.]—*Arch. Mikrobiol.*, vi, 4, pp. 309–325, 4 figs., 1 graph, 1935.

Pure auxin A (a cell-elongating phytohormone detected by Nielsen (*Jb. wiss. Bot.*, lxiii, p. 125, 1930) [*R.A.M.*, xv, p. 42] was found to exert no influence on fungal growth in nutrient solutions and could not be detected in the cultures by tests with *Avena* coleoptiles, which normally react to this substance by simultaneous curving and extension. Auxin is highly sensitive to oxidation and may have succumbed to this process.

Under the experimental conditions bios (which is obtainable from bakers' yeast and contains the phytohormone of cell division) [ibid., iii, p. 393], in appropriate concentrations, stimulated the development [as estimated by the dry weight of mycelium] of *Aspergillus niger*, *Sporodinia grandis*, *Allomyces javanicus*, *Ascochyta pisi* [ibid., xiv, p. 614], *Glomerella cingulata* [see above, p. 104], *Ophiobolus graminis*, *Cercosporella herpotrichoides* [ibid., xiv, p. 748], *Phytophthora citrophthora* [see above, p. 80], *P. erythroseptica* [ibid., xiii, pp. 180, 531], *P. terrestris* [*P. parasitica*: ibid., x, p. 755 *et passim*], and *P. cactorum* [ibid., xiv, p. 707; xv, p. 35]. No response to the bios treatment was manifested by *Helminthosporium sativum*, *Pythium irregulare* [ibid., xi, p. 330], and *P. de Baryanum*, while *P. mamillatum* [ibid., xiv, p. 240] and *P. intermedium* [ibid., x, pp. 696, 732] reacted by a retardation of growth. *P. acanthicum*, after a preliminary set-back, developed better with than without bios, which further slightly stimulated the growth of *P. splendens* [ibid., xi, p. 650]. It is considered remarkable that the closely related species of *Phytophthora* and *Pythium* used in these trials should respond so differently to the bios treatments. Attempts to separate the stimulatory from the inhibitory principle in the bios solution were unsuccessful.

The formation of Nielsen's growth substances A, identical with Kögl's heteroauxin, and B (*Jb. wiss. Bot.*, lxxiii, p. 125, 1930) was investigated in a number of fungi with very divergent results. *G. cingulata* produced an extraordinarily large quantity of A (35 γ per l. in six days, estimated according to the method of Went, *Rec. trav. bot. néerl.*, xxv, p. 1, 1928), the corresponding amounts for *P. mamillatum* and *P. intermedium* being 3·6 and 1·15 per l.; in 30 days *O. graminis* and *C. herpotrichoides* yielded, respectively, 0·6 and 1·2 γ per l., and in

14 days *Graphium* [*Ceratostomella*] *ulmi* formed 0·78 γ. Other organisms, including *P.* and *Phytophthora* spp., produced none of substance A during the period of the experiments. The sterilization of the nutrient solution inhibited the further development of substance A by *Glomerella cingulata*. Substance B, the production of which was estimated from the dry weight of mycelium grown in the sterilized old culture solutions, was formed in great abundance by *Rhizopus suinus* and in very much smaller quantities by *Cercosporella herpotrichoides*, *G. cingulata*, and *A. pisi*.

Olsen (C.). **Iron absorption and chlorosis in green plants.**—*C.R. Lab. Carlsberg*, xxi, 3, pp. 15–52, 1 col. pl., 14 figs., 1 graph, 1935.

In experiments at the Carlsberg laboratory, Copenhagen, plants requiring relatively large amounts of iron for their normal growth [cf. *R.A.M.*, xiv, p. 121], such as *Xanthium spinosum* and maize, were found to develop chlorosis in Knop's solution at P_H 6 to 7, this development being preventible by the addition of humus extract or ferric citrate. The leaves of chlorotic maize plants at P_H 7 frequently contain more iron than those of normal green ones at P_H 4·5 or 8, and are invariably better supplied with phosphate, calcium, magnesium, potassium, and nitrogen. This apparent anomaly is due to the fact that, with the onset of chlorosis, the production of organic matter ceases or greatly declines, while the absorption of salts from the nutrient solution continues. The inorganic substances are thus distributed over a smaller amount of dry matter in the chlorotic than in the normal plants.

Chlorosis in maize plants at P_H 6 to 7 results from the excessive absorption of phosphate, involving the precipitation of iron as phosphate in the vascular bundles, whence it is unable to pass into the mesophyll. An increase in the amount of phosphate in the nutrient solution causes an intensification of chlorosis at P_H 6 to 7 and further permits the disturbance to develop in the alkaline solutions, which now contain an excess of phosphate relative to calcium. Exactly the same effect is produced by decreasing the quantity of calcium, e.g., to one-fifth of the normal in Knop's solution.

Ferric tartrate was found to be somewhat less effective than ferric citrate or humus extract as a source of iron. On the other hand, chlorosis may be entirely prevented by the admixture with the nutrient solution of small quantities of ferrous salts, especially ferrous sulphate. Further observations indicate that in nature ferrous ions may act as a source of iron for plants, particularly in soils to which air cannot readily penetrate. For instance, the yellowing of beet foliage frequently encountered during the recent dry summers in Denmark has been found to be associated with iron deficiency, the amount of this mineral in the discoloured leaves being only 13 to 24 mg. per 100 gm. dry matter compared with a normal iron content of 38 to 63 mg. But this disturbance does not affect beets fertilized with Chile saltpetre [cf. ibid., xiv, p. 733], which exerts a binding action on the soil and thus furnishes the necessary conditions for the absorption of ferrous ions by the plants.

EATON (S. V.). **Influence of sulphur deficiency on the metabolism of the Soy bean.**—*Bot. Gaz.*, xcvii, 1, pp. 68–100, 3 figs., 1935.

This study on the effect of sulphur deficiency [cf. *R.A.M.*, xiii, p. 217; xiv, p. 610] on the growth of the soy-bean, was made on plants grown in quartz sand supplied with appropriate nutrient solutions. In the minus sulphur series the symptoms, which began to show up after four weeks and had become pronounced in six weeks, consisted chiefly in the yellow-green colour of the leaves, the smaller leaflets, and the thinner and harder stems, the yellowing affecting the upper leaves first. There was a tendency for the lower leaves to die and fall off, and the plants were less succulent than those of the plus sulphur series. Sulphur deficient plants had poor root development but the roots were not stunted as much as the tops. Similar effects of sulphur deficiency were observed on sunflower, kale, rape, and mustard, in contrast to tomato where the lower leaves become yellow first; in the case of mustard there was a definite reduction in the mustard oil content. The effects of sulphur deficiency on the chemical composition of the soy-bean are discussed in detail.

THOMPSON (A.). **Diseases of the Potato plant at Cameron Highlands.**—*Malay agric. J.*, xxiii, 9, pp. 410–420, 1 pl., 1935.

A brief popular account is given of three diseases of the potato, which have been observed in the Cameron Highlands in Malaya, where the cultivation of the crop is being attempted at altitudes above 3,000 ft., the plains being unsuitable for climatic reasons. The diseases dealt with are late blight (*Phytophthora infestans*) which was first recorded towards the end of 1934, and is stated to have already caused considerable damage; early blight (*Alternaria solani*); and bacterial wilt (*Bacterium solanacearum*) [see above, p. 80] which, if unchecked, may become very dangerous to potatoes in the Malayan highlands. Control measures against all three diseases are briefly discussed.

BERKNER (F.). **Der Einfluss zurückliegender Kalidüngungen auf das Trachtenbild (Abbauerscheinungen) sowie die Nährstoffaufnahme und die späteren Erträge der Kartoffelpflanze. III. Mitteilung.** [The influence of past applications of potash fertilizers on the performance (degeneration phenomena), assimilation of nutriment, and subsequent yields of the Potato plant. Note III.]—*Landw. Jb.*, lxxxi, 3, pp. 393–423, 1935.

A fully tabulated account is given of the writer's experimental observations at the Breslau Institute of Agriculture and Genetics on the connexion between past applications of potash fertilizers and potato degeneration (mosaic, leaf roll, and dwarfing) [*R.A.M.*, xii, p. 237], scab [*Actinomyces scabies*: ibid., xiii, pp. 50, 651], and 'Eisenfleckigkeit' [*R.A.M.*, xiii, p. 590; xiv, p. 717].

An appreciable increase in the incidence of all these diseases appeared to result from the potash treatments, the effects of which persisted for two years, potassium chloride being particularly liable to induce high percentages of scab [but see ibid., xv, p. 46] and 'Eisenfleckigkeit' in the Cellini variety. The amount of degeneration in the 1934 crops

treated the previous year with potash was estimated at 10 per cent. above that in the plots receiving none of this fertilizer, the corresponding increases for scab being 40 and 70 per cent. for potassium sulphate and potassium chloride, respectively. In the case of 'Eisenfleckigkeit' potassium sulphate augmented the trouble by 30 and potassium chloride by 70 per cent. The incidence of scab and 'Eisenfleckigkeit' in the Cellini plots receiving no potash was 25 and over 20 per cent., respectively.

A noticeable feature of the experiments was the virtual freedom from degeneration of the stands deriving from late (July) plantings in 1932.

Bell (R. H.). **Further notes on chemical sterilization as a means of eradicating Potato wart disease from the soil.**—*J. econ. Ent.*, xxviii, 3, pp. 519–524, 1935.

A tabulated account is given of experiments from 1932 to 1934, inclusive, in Pennsylvania, on soil disinfection against potato wart disease [*Synchytrium endobioticum*: *R.A.M.*, xiv, p. 788] by chemicals. Applications to artificially inoculated plots in 1932 of ammonium sulfocyanate at the rate of 1,200 and 2,000 lb. per acre gave entire control of the disease but resulted in a slow and incomplete germination and retarded growth of the potatoes (susceptible Rurals) which were planted two months after treatment of the soil; in 1933, however, the same plots without further treatment showed normal germination, growth, and yield of the potatoes, and continued freedom from wart disease, while the controls showed 90 per cent. infection. Spring applications of the cyanate in 1933 to artificially inoculated plots at rates from 800 to 3,200 lb. per acre also showed a similar depressing effect on the germination, development, and yield of the potatoes, proportionate to the dose applied, no wart developing in plots treated with 1,600 lb. or more per acre. An application at the rate of 2,000 lb. per acre to a naturally infected garden in April, 1933, retarded germination by 10 days but did not harm the development of Rural Russet potatoes planted 80 days later, while the most careful examination failed to reveal any indication of wart in the crop and the yield was well over 300 bush. per acre. Potatoes planted in this garden in 1934 without further treatment yielded 392 bush. per acre, without any trace of wart.

In the autumn of 1933 twelve naturally infected gardens were treated with the cyanate at the rate of 2,000 lb. per acre and a series of artificially inoculated plots were treated at rates from 1,600 to 3,200 lb.; all were planted to potatoes in the spring of 1934. The treatment gave entire control of the disease in ten of the twelve gardens, but 30 plants out of 4,000 in a garden that had remained under grass for 15 years were warted, and one plant was diseased in the twelfth, this small residue being presumably due to the physical condition of the soil. In every garden germination was markedly delayed, and in places where the concentration of the chemical was high, due to drainage, no plant growth developed. The plants, however, which did grow became very vigorous, owing in part to the fertilizing effect of the ammonium present in the chemical. In the other plots treated germination was retarded in all except the 1,600 lb. plots, but no wart disease developed in any.

The Potato crop, 1935.—*Mon. Rep. Minist. Agric. N. Ire.*, x, 5, pp. 12–13, 1935.

Of the area under potatoes in Northern Ireland in 1935, viz., 129,015 acres, 105,663 acres or 82 per cent. were sown to varieties immune from wart disease [*Synchytrium endobioticum*]; there has been a steady increase in the percentage of the total area planted to immune varieties every year since 1926. In 1935, the most popular varieties grown were again Arran Victory and Kerr's Pink, accounting for 39 and 26 per cent., respectively, of the total area.

Němec (A.). **Příspěvek k seznání chemické povahy půdy pozemků zamořených rakovinou Bramborů.** [Contribution to the knowledge of the chemical properties of soils infected with Potato wart disease.]—*Zem. Arch.*, xxvi, 3–4, pp. 129–132, 1935. [French summary.]

This is a Czecho-Slovakian version of a paper noticed from another source [*R.A.M.*, xiv, p. 650].

Park (M.) & Bertus (L. S.). **Sclerotial diseases of Rice in Ceylon. 3. A new Rhizoctonia disease.**—*Ceylon J. Sci.* (formerly *Ann. R. bot. Gdns Peradeniya*), xii, 1, pp. 1–10, 1 pl., 1934. [Received December, 1935.]

In continuation of this series of studies on the sclerotial diseases of rice in Ceylon [*R.A.M.*, xi, p. 599], the authors give an account of an outbreak which only occurred in 1926 on seedling rice at the experimental station, Peradeniya, when the plants were about 6 in. high. The diseased seedlings were pale in colour and 'thin' in appearance. The unfolded central leaves of the shoots of some of the plants were brown at the tips, and discoloured lesions were present on the leaves and stems. While none of the affected seedlings was killed, the attack resulted in a set-back to the plants. Hyphae of the *Rhizoctonia* type were found in and on the leaf and stem lesions, but the fungus was not observed to attack the roots. Isolations on maize meal agar produced a growth similar to that of *R.* [*Corticium*] *solani* [loc. cit.], but differing from it in the abundant production of small sclerotia (1 to 2, but occasionally up to 4 mm. in diameter) and in the persistent pale buff colour of the latter; in some strains a small proportion of the sclerotia become dark coloured, and resemble closely those of *C. solani*. The sclerotia, which have not been found in nature, commonly coalesce to form irregular sclerotial masses.

In inoculation experiments rice seedlings grown in tubes were invariably attacked by the fungus and a few were killed, but most commonly infection was restricted to the outermost leaf-sheath. Seedlings in pots were not infected to any extent, unless the soil was water-logged, when 25 per cent. of the plants kept under shaded conditions were killed, but only 15·2 and 8·2 per cent. of those kept in the open. Under flooded conditions infection and mortality were 100 per cent. in the shade, but only 12·9 of the plants died in the open, although most of the seedlings showed local infection in their outer leaf-sheaths. With older plants local infection occurred in the outer leaf-sheaths

of all the plants inoculated under flooded conditions, and a few of the plants were killed.

Sclerotia of the fungus survived 133 days in moist soil, 641 days in sealed tubes, and 571 days under tap-water, but could not withstand exposure to sunshine for 207 hours during 39 days.

While the differences between this fungus and *C. solani* are not sufficient to warrant their taxonomic separation, some distinction between them appears to be necessary, especially because of the marked difference in their pathogenicity. The authors accordingly distinguish the new fungus as strain A of *R. solani*.

PARK (M.) & BERTUS (L. S.). **Sclerotial diseases of Rice in Ceylon. 4. Sclerotium oryzae A strain.**—*Ceylon J. Sci.* (formerly *Ann. R. bot. Gdns Peradeniya*, xii, 1, pp. 11–23, 2 pl., 1 graph, 1934. [Received December, 1935.]

In this further instalment of this series [see preceding abstract] the authors describe a disease of rice, which was first reported in 1927 from the Southern Province of Ceylon, and which since then has been found on several occasions on rice and on stubble after harvesting. The disease was experimentally shown to be caused by a fungus which is considered to be a strain of *Sclerotium oryzae* [*Leptosphaeria salvinii*: *R.A.M.*, xv, p. 47], and is named *S. oryzae* A strain. The field symptoms caused by it are very similar to those produced by *S. oryzae* [ibid., xi, p. 599], the only difference of diagnostic value being that the new strain most commonly forms sclerotia inside the stems of affected rice plants, whereas *S. oryzae* produces abundant superficial sclerotia. The behaviour of both forms is also very similar in pure culture on various media, the chief difference being that *S. oryzae* on glucose agar forms a smoky white felt of mycelium, the colour of the medium being changed to pale crimson or crimson red, and sometimes to maroon brown, while the A strain forms a dark greyish-brown felt and changes the colour of the medium to a pale buff and then to a raw umber. Both fungi produce chains of pale olive-brown chlamydospore-like cells in this medium. Slight differences on other media are also briefly indicated. A further important difference between the two forms is that while the sclerotia of *S. oryzae* are sphaeroidal, smooth, black, and shiny, and 195 to 342 μ in diameter (175 to 580 μ in pure culture, mean $374 \pm 4 \cdot 3\ \mu$), those of A strain are irregular in shape, dull, not smooth, and 114 to 342 μ in diameter (76 to 410 μ in culture, mean $233 \cdot 25 \pm 3 \cdot 082\ \mu$).

Sclerotia of the A strain germinated after 133 days in moist paddy soil, 224 days in tap-water and 394 days in a corked specimen tube in the laboratory but were killed after 172 hours' exposure to the sun during 33 days.

Control by burning diseased plants *in situ* after harvesting is recommended.

PARK (M.) & BERTUS (L. S.). **Sclerotial diseases of Rice in Ceylon. 5. Rhizoctonia solani B strain.**—*Ceylon J. Sci.* (formerly *Ann. R. bot. Gdns Peradeniya*), xii, 1, pp. 25–36, 1 pl., 1 graph, 1934. [Received December, 1935.]

Continuing their studies in this series [see preceding abstracts], the

authors give an account of a disease of rice which was recorded only twice in Ceylon, namely, in 1927 from the Southern Province (in association with *Sclerotium oryzae* A strain) and again in 1931 from Kegalla. The diseased plants examined were found to be attacked occasionally at the first internode and more generally at the second and third internodes, suggesting that they had been infected at water-level much earlier; the diseased tissue was dirty brown, and some parts readily bent over at the point of attack. Sclerotia were relatively few in number, superficial, brown, purple-brown, or dark purple-brown, and roughly spherical macroscopically but of diverse shapes under the microscope; they were easily detached from the hyphae. The fungus was grown in pure culture on various media, and was found to differ from *Rhizoctonia*, [*Corticium*] *solani* and its A strain mainly in the shape, colour, and smaller size of the sclerotia, those collected from the base of rice stems measuring less than 1 mm., while in culture individual sclerotia attained 780 μ in diameter, the average being 472 μ; it is regarded as a new strain, B, of *R.* [*C.*] *solani.*

In inoculation experiments on rice seedlings, the fungus consistently failed to establish itself, even under the very favourable conditions of the tests in contrast to the other two strains. On older rice plants it is weakly parasitic, infecting the host at water- or ground-level, and not from the tips of the leaves. Flooded conditions do not appear to favour the parasitism of this strain and in none of the experiments did the fungus penetrate the roots of any of the plants tested. Viability tests showed that the sclerotia were still viable after 571 days immersion in tap water, and after 237 days in a corked tube in the laboratory. They also germinated after exposure for 284 hours to the sun during a period of 57 days.

Beeley (F.). **Oidium heveae. Report on the 1935 outbreak of Hevea leaf mildew.**—*J. Rubb. Res. Inst. Malaya,* vi, 1, pp. 49–57, 1 graph, 1935.

The author gives notes on the occurrence of *Hevea* rubber mildew (*Oidium heveae*) [*R.A.M.*, xiv, p. 791] in Malaya during the first four months of 1935. Fine, dry weather in January and February induced 'wintering' (i.e., shedding of old leaves and the production of new ones), with the result that a large proportion of the trees had obtained a good, healthy crown of foliage before the weather favoured infection. Only in a few, isolated localities was mild leaf fall reported; in most cases it was favoured by climatic conditions caused by the proximity of mountains. In the Seremban, Siliau, and Rantau districts a considerable amount of sulphur dusting was carried out, but the effects of the disease were so slight owing to the prevailing weather that the foliage showed no visible improvement from the treatment, even after four weekly applications.

Cholodny (N. G.). Методы непосредственного наблюдения почвенной микрофлоры. [Methods for the direct observation of soil microflora.]—*Микробиол.* [*Microbiol.*], iv, 2, pp. 153–165, 1935. [English summary.]

The writer reviews the literature on the application to soil micro-

biological investigations of his 'overgrow plate' method [*R.A.M.*, xiv, p. 469], which has been found generally useful in spite of various defects, notably its unsuitability for the study of the dynamics of soil processes. The method is compared with the improved soil chamber technique [ibid., xiii, p. 471], the results obtained with which in a microbiological study of a forest soil near Kiev in the summer of 1935 are summarized. Not only were the common soil fungi readily determined by this method, but certain species of greater interest were detected which are liable to escape notice on the ordinary solid media, e.g., *Coëmansia reversa* Van Tiegh [cf. ibid., xii, p. 191] and *Helicomyces candidus* Cda. Experiments on cellulose decomposition [cf. ibid., xiv, p. 584] showed that in a soil chamber all the consecutive stages of this process can be observed and the part played therein by different micro-organisms determined.

SALGUES (R.). **Les modifications biochimiques en phytopathologie.** [Biochemical modifications in phytopathology.]—*C.R. Soc. Biol., Paris*, cxix, 27, pp. 1396–1398, 1935.

Pharmaceutical analyses of the leaves of *Aconitum napellus* infected by the dirty grey to ashen, dark-bordered lesions of *Septoria lycoctoni* Speg. var. *macrospora* C. Mass. from the Lower Alps (France) showed in comparison with healthy ones no appreciable reduction of the alkaloid content. On the other hand, *Phyllosticta matthiolana* (Sacc. & Matt.) McAlp., the agent of oval or spherical, brown, often confluent spots on *Prunus laurocerasus* var. *schipkaensis* leaves was found to cause a considerable loss of total glucosides and hydrocyanic acid and a marked increase of soluble sugars with a corresponding diminution of insoluble polysaccharides, the composition of the adult diseased leaves examined in June being substantially identical with that of young healthy ones analysed in April.

ROLDAN (E. F.) & TECSON (J. P.). **The red rot of Sugar Cane caused by Colletotrichum falcatum Went.**—*Philipp. Agric.*, xxiv, 2, pp. 126–141, 2 figs., 1935.

Red rot of sugar-cane (*Colletotrichum falcatum*) [*R.A.M.*, xiv, p. 657] is stated to be of common occurrence but generally relatively unimportant in the Philippines, where it was first reported by Reinking in 1919. Germination and yield are not as a rule materially affected but comparative analyses of the sucrose contents of healthy and diseased canes showed a reduction in the latter of 31 per cent. The Pampanga Red, Luzon White, Wailuku No. 2, Mauritius 1900, and Zambales White varieties are susceptible to red rot, while P.O.J. 2878, Hawaii 109, and Linabing are more resistant. *C. falcatum* is a feeble parasite, pathogenic only to canes weakened and wounded by insects or mechanical agencies. The chief sources of inoculum are infected dried stalks, leaves, and clumps, while the spores are disseminated by wind, rain drops, insects, and irrigation water. Control measures should include seed selection, use of resistant varieties, elimination of sources of infection, and omission of ratooning in serious cases.

Liro (J. I.). **Mycotheca Fennica. Die Etiketten Nos 1–300.** [Mycotheca Fennica. Labels Nos. 1–300.]—98 pp., 1 map, Inst. Phytopath. Univ. Helsinkiensis, Helsingfors, 1934. [Received December, 1935.]

This booklet consists of copies of the labels of the first 300 exsiccata of the above series, all of which were issued in December, 1934. The species are all pathogens, and are accordingly mainly rusts, smuts, powdery and downy mildews, Exoascales, or members of the Fungi Imperfecti. Included in the collection are four new species of *Cintractia* on species of *Carex*, and one each of the genera *Doassansia* and *Entyloma*; these are provided with diagnoses in German. *Doassansia limosellae* is transferred to *Burrillia* as *B. limosellae* (Kunze) Liro. The author accepts the generic name *Tuburcinia* (13 species) in lieu of *Urocystis*, and *Albugo* in lieu of *Cystopus*. Under each name, in addition to the locality, collector, and date, the necessary systematic literature is cited. The Finnish literature is also quoted or alternatively the species (or host) is starred as a new record for Finland. Finally a map of the country is marked off with the accepted phytogeographical provinces.

Zeller (S. M.). **Some miscellaneous fungi of the Pacific Northwest.**—*Mycologia*, xxvii, 5, pp. 449–466, 3 figs., 1935.

This is an annotated list of 45 miscellaneous fungi which were collected in the Pacific Northwest of the United States, including one genus and four species which are described as new. The following may be mentioned. *Nectria ditissima* var. *major* Wr., apparently unrecorded hitherto in North America, was found on *Alnus oregona*. *Atropellis pinicola* [*R.A.M.*, xiii, p. 685] was collected on *Pinus strobus* and on *P. lambertiana* in the Calaveras County of California, this extending the southern known limit of its range. The pycnidial fungus usually associated with it, which was previously referred to *Fuckelia pinicola* [ibid., ix, p. 815], is now transferred to a new genus, *Neofuckelia*, which is created for it [with Latin and English diagnoses]; the new genus differs from *Fuckelia* chiefly in that its pycnidia are ostiolate and in one stratum, while in the latter they are closed and merely locules without particular arrangement in the globose stroma. *Cenangium piniphilum* Weir was found on *P. albicaulis*, a new host. *Rhizina inflata* [*R. undulata*: ibid., xiv, p. 633] was observed attacking the roots of *P. contorta* and smothering two- to three-year-old seedlings; this is the first record of the fungus west of Idaho. *Fomes annosus* was collected from felled logs of *Acer macrophyllum*, an interesting instance of this fungus on a hard wood. *Glutinium macrosporum* [ibid., vi, p. 735], which occurs on apple bark, was examined by Miss Wakefield who found it to be synonymous with *Sphaeronema pruinosum* Peck; this is now confirmed by the author, who, however, does not believe the fungus to be a good species of *Sphaeronema*, but leaves the question of its classification open. *Diplodia sycina* var. *syconophila* [ibid., iv, p. 610] was found for the first time on *Ficus carica* in Oregon. *Ramularia destructans* occasionally caused a foot rot of *Panax quinquefolium* in Columbia.

SHEAR (C. L.) & STEVENS (N. E.). **Sphaeria zeae (Diplodia zeae) and confused species.**—*Mycologia*, xxvii, 5, pp. 467–477, 2 figs., 1935.

The authors produce evidence showing that the fungus now generally known as *Gibberella saubinetii* [*R.A.M.*, xiv, p. 749] was described by L. v. Schweinitz as *Sphaeria zeae* in 1822, and that the well-known *Diplodia zeae* (Schw.) Lév. was called by v. Schweinitz in the same year *S. striaeformis* γ. They consider that, according to the present International Rules of Nomenclature, *G. saubinetii* and *D. zeae* should have new specific names, but this course is deprecated, as the present names have been established by usage for over 50 years. Fungi synonymous with *D. zeae* are: *Sphaeria striaeformis* var. γ, Schw. 1822, *S. zeae* Schw. 1832, *S. maydis* Berk. 1847, *S.* (*Hendersonia*) *zeae* (Schw.) Curr. 1859, *H. zeae* (Curr.) Hazsl. 1873, *D. maydis* (Berk.) Sacc. 1884, *Diplodia zeae* (Schw.) Lév. 1848, *Dothiora zeae* (Schw.) Bennett 1888, *Macrodiplodia zeae* (Schw.) Pet. & Syd. 1923, and *Phaeostagonosporopsis zeae* (Schw.) Woronich. 1925 [ibid., x, p. 295].

STOREY (H. H.). **Virus diseases of East African plants: II—Leaf-curl disease of Tobacco.**—*E. Afr. agric. J.*, i, 2, pp. 148–153, 6 figs., 1935.

Tobacco leaf curl [*R.A.M.*, xiv, p. 533] appears to occur throughout Africa, wherever tobacco is grown, and in many parts of East Africa it is probably the most serious disease of the crop. After giving a brief account of the symptoms, the author states that the leaf curl virus has not yet been transmitted by mechanical inoculation with infected sap, but is readily transmissible by grafting. Transmission experiments with the insect vector (*Bemisia* sp.) have been successful only when healthy tobacco seedlings were colonized with large numbers of adult white flies transferred from a diseased plant. Enations, similar to those produced by the disease in tobacco, were found on *Vernonia* and *Sida* spp. in Tanganyika, Nyasaland, and Southern Rhodesia. In one experiment at Amani leaf curl was successfully transferred by white flies from *V. iodocalyx* to tobacco, but the reciprocal experiment, from tobacco to *Vernonia*, only produced vein-clearing. The virus was transmitted [from tobacco] to tomato plants, which became stunted and curled, but failed to develop the characteristic enations. Cotton leaf curl is unknown in East Africa and further, cotton varieties susceptible to leaf curl [ibid., xiv, p. 757] did not contract the disease when grown together with leaf-curl tobacco; it appears, therefore, that in East Africa the disease is not intertransmissible between tobacco and cotton. Attempts to breed varieties of tobacco immune from leaf curl gave negative results, sixteen imported varieties and also hybrids with other species of *Nicotiana* proving susceptible.

MCKINNEY (H. H.). **The antigenic properties of plant viruses.**—*Science*, N.S., lxxxii, 2125, pp. 276–277, 1935.

While agreeing in general with Chester's conclusions as to the antigenicity of plant viruses [*R.A.M.*, xiv, p. 782], the writer takes exception to certain steps in the experimental procedure and interpretation of the results. For instance, a study of the graphs showing the effect of temperature on four different tobacco viruses indicates that, though

each of the vertical scales appears to be plotted on a logarithmic basis, the infectivity scale is not truly logarithmic throughout, since the upper end is abnormally compressed in relation to the lower portion. The precipitin dilution scale, on the other hand, is uniformly logarithmic throughout. The determination of the infectivity data from the graphs was very difficult in the absence of a numerical method of presentation, but close estimates were obtained and replotted, together with the serological reaction figures, on semi-logarithmic paper. It was found that, in the cases of tobacco mosaic and ring spot, the datum points for infectivity and serological reaction of the unheated viruses do not coincide, the discrepancy being particularly marked in the former virus. The curve proximity emphasized by Chester is accentuated by the use of the logarithmic scale which compresses parallel with the increasing magnitude of the data. There appears, however, to be a close coincidence between the highly significant infectivity and serological reaction end points of the heated and chemically treated viruses used in the tests.

Koenig (P.) & Rave (L.). **Beiträge zur Tabak-Systematik und -Genetik. I. Sortenmerkmale am deutschen Tabak.** [Contributions to the taxonomy and genetics of Tobacco. I. Varietal characters of German Tobacco.]—*Landw. Jb.*, lxxxi, 3, pp. 425–503, 9 pl., 7 figs., 1935.

A few items of phytopathological interest occur in this comprehensive survey of the varietal characters of German tobaccos, preceded by an historical introduction to the taxonomy and genetics of *Nicotiana*. At the Forchheim (Baden) Research Institute, resistance to wildfire [*Bacterium tabacum*: *R.A.M.*, xv, p. 61] has been manifested not only by the wavy-leaved Amersfoort 1/5 itself but also by its hybrid progeny. On the other hand, a leaf curl of the 'mauke' type [ibid., vii, p. 548] occurring in a severe form in 1932 appears to prefer the Amersfoort and U types and their offspring.

Armstrong (G. M.) & Sumner (C. B.). **Investigations on downy mildew of Tobacco.**—*Bull. S.C. agric. Exp. Sta.* 303, 23 pp., 1 fig. 1 graph, 1935.

Tobacco downy mildew (*Peronospora tabacina*) [*R.A.M.*, xiv, p. 723 and next abstracts] appeared in South Carolina, probably for the first time, in the spring of 1931, when it was also present in Georgia and North Carolina. A year later it returned, reducing the yield by approximately 40 per cent., since when it has recurred every year and though not causing any great damage constitutes a permanent threat to the local tobacco industry.

In 1932, severe losses from the fungus also occurred locally on pepper [*Capsicum annuum*: ibid., xiv, p. 723], but only insignificant infections have been noted on this host since.

When numerous tomato, eggplant, and pepper plants were inoculated with the conidia of *P. tabacina* from tobacco and kept in special temperature-humidity chambers, lesions developed in a few days, but conidia were produced only on one tomato leaf, though tobacco plants similarly treated developed the disease abundantly. Tomato and egg-

plant seedlings, inoculated, and placed in the shade at the edge of an infected tobacco bed bore conidia after five days, pepper seedlings used in the same test producing conidia on the seventh day. Inoculations with conidia from pepper gave positive results on tobacco.

The conidia germinated at temperatures from 1° to 3° up to 29° C., with the optimum between 15° and 23°, and on dry slides at relative humidities of 98·2 per cent. and over. At 16° to 20° fresh conidia showed very high percentage germination in 24 hours, though on several occasions germination was markedly delayed. All attempts to germinate the oospores failed. A relative humidity below dew-point (i.e., between 78 and 89 per cent) and a temperature of 16°±1° permitted the production of conidia and enabled infection to take place from inoculations made under these conditions.

Inoculated tobacco plants kept for 12 days at 31·5° to 32° showed no symptoms of the disease; infection occurred at 30°, but no conidia were produced. Abundant infection with conidial production occurred on two very small, succulent plants kept at 25° to 26°, some fruiting being noted on four leaves of larger plants. No infection took place below 5° to 8° C.

Field observations supported the view generally held by growers that recovered plants cease to be susceptible, but in experiments repeated infection of such plants was obtained. Young hardened plants were less susceptible than older, succulent ones. Sporadic sporulation seen in beds during two winters probably resulted from the persistence of the fungus within the host [cf. ibid., ix, p. 3].

Satisfactory control resulted from maintaining a constant minimum temperature of 31° in the beds [ibid., xiii, p. 402], but the method is too expensive for the average grower. Spraying with cal-mo-sul [loc. cit.] (1 and 2 oz. per gall.) gave encouraging results, two representative sprayed beds averaging (after recovery) 1,465 plants each, as compared with 423 in the controls, while six beds sprayed six times with cal-mo-sul and colloidal sulphur averaged, respectively, 450 and 554, as compared with 349 in the unsprayed controls. In a more extensive test, beds were sprayed eight times at 4-day intervals with cal-mo-sul (2 oz. per gall.), colloidal copper, and red copper oxide [ibid., xiv, pp. 218, 563] (½ oz. per gall. with a spreader), unsprayed control beds being interspersed with the treated ones. The cal-mo-sul treatment gave 19 healthy plants, 263 plants with less than a quarter of the leaf area affected, 206 with less than half, and 12 with the entire leaf area affected, the corresponding figures for colloidal copper being 7, 284, 203, and 6; for red copper oxide 4, 237, 249, and 10; and for the controls 0, 139, 335, and 26.

The paper terminates with brief general suggestions for control by improved cultural practices.

Angell (H. R.), Hill (A. V.), & Allan (J. M.). **Downy mildew (blue mould) of Tobacco: its control by benzol and toluol vapours in covered seed-beds.**—*J. Coun. sci. industr. Res. Aust.*, viii, 3, pp. 203–213, 1935.

In experiments carried out in Australia on the control of tobacco downy mildew (*Peronospora tabacina*) [see preceding and next abstracts]

by hydrocarbon vapours healthy seedlings in pots were placed in six cold frames with a pot of diseased seedlings in the centre of each. Four dishes with a total evaporating surface of 50 sq. in. were placed in each of four frames and filled twice daily until 20th February with benzol, toluol, xylol, and naphtha, respectively. Equal amounts of a heavy suspension of the conidia of *P. tabacina* were sprayed on all the seedlings on 8th February, and three days later every seedling in the control frame was diseased. On 12th February, scattered infections were noted in the xylol- and naphtha-treated frames, but all the plants in the benzol- and toluol-treated frames were still healthy when the experiment was concluded on 27th February.

To determine the effect of removing the covers and liquids on five days (four beds being kept closed for purposes of comparison), two seed-beds 66 by 6 ft. were sown on 1st March. Exposure to benzol, toluol, and motor spirit was begun on 13th March in ten cold frames, four others serving as controls. On three occasions between 12th and 26th April conidia of *P. tabacina* were shaken over each frame. When the experiment was concluded on 31st May, most of the controls had been killed by the disease; infection was present in both the beds in which ordinary petrol was used, but all the seedlings treated with benzol and toluol had remained healthy, irrespective of the cover used (glass, windolite, or oiled calico), in the frames opened on five days and in those kept closed, and with evaporating surfaces maintained at 50 sq. in. or gradually reduced from that area to 25 sq. in.

Further tests were made with benzol and toluol in 40 beds of the Bathurst type, the surface area of liquid exposed being approximately 1/144, 1/72, and 1/36 of the areas of the beds. The seedlings were inoculated on 3rd, 5th, and 11th May, and by 6th June all the controls were dead or dying. In every instance the smallest evaporation surface allowed isolated areas of very slight infection to develop, but the spread to other plants was extremely slow. When the evaporation surface area was not less than 1/72 that of the seed-bed, benzol completely prevented infection and toluol very nearly so.

Further experiments under the conditions that prevail locally in spring must be made before the methods described can be recommended for commercial use.

Tobacco diseases. Smoking tests.—*Qd agric. J.*, xliv, 1, pp. 37–39, 1935.

In tests carried out by the Commonwealth Bureau of Scientific and Industrial Research in Victoria and New South Wales spraying with copper emulsion, colloidal copper, and Bordeaux mixture did not prevent infection of tobacco by blue mould [*Peronospora tabacina*: see preceding abstracts] but tended to check the spread of the disease. Extremely satisfactory results were obtained, however, in experiments with benzol and toluol. Experimental evidence showed that the sprays recommended by the Queensland Department of Agriculture against *P. tabacina* [ibid., xiii, p. 332] were also effective against leaf spot [*Cercospora nicotianae*: ibid., xiv, p. 200].

No commercial varieties of tobacco are immune from *P. tabacina*, but some are less susceptible than others. It is suggested that the native home of tobacco, South and Central America, should be searched for

resistant types which could be used in hybridizing with commercial lines to develop resistant strains. The wild host *Nicotiana glauca* was found heavily infected in Victoria.

SMITH (K. M.). **Two strains of streak: a virus affecting the Tomato plant.**—*Parasitology*, xxvii, 3, pp. 450–460, 2 pl., 1935.

The author gives a brief description of the symptoms produced on tobacco (White Burley), *Nicotiana glutinosa*, *N. langsdorffii*, tomato, *Datura stramonium*, *Hyoscyamus niger*, *Petunia* sp., and potato (Arran Victory) by inoculation with a virus which was obtained in 1931 from a tomato plant exhibiting the typical symptoms caused by tomato streak virus No. 1 [*R.A.M.*, xiv, p. 261]. He considers that this virus is probably a green strain of the latter virus, intermediate in character between this virus and tobacco mosaic virus No. 1 [ibid., xiv, pp. 661, 722], inasmuch as it resembles tomato streak No. 1 in the leaf mottling and occasional stem necrosis it induces in tobacco, and resembles tobacco mosaic virus No. 1 in the mottling produced in tomato, usually without stem necrosis, while differing from it in the comparative absence of leaf distortion in tobacco; it differs from both in its usually fatal effect on young *N. glutinosa* plants. The new strain was maintained for four years by transfers in White Burley tobacco, and in 1934 it was noticed that one of the inoculated plants had developed a small yellow spot. Inoculations were made from this spot into young tobacco plants, and after about six such transfers, in which the yellow tissue alone was used for inoculation, a virus was isolated which produced a bright yellow mottling on leaves of White Burley tobacco.

It was not found possible to isolate the yellow strain of the virus absolutely free of the green. However highly concentrated the yellow strain appeared to be in the inoculum, the inoculated leaves always showed finally a great preponderance of green virus with here and there a few yellow spots, the only apparent effect of increasing the concentration of yellow virus being a slight increase in the number of local yellow spots. It appears that while the yellow strain is multiplying locally to form the spots, the green virus, which usually produces no local symptoms, becomes systemic to the exclusion of the yellow, the more so since the green strain (which can be isolated absolutely free of the yellow one) immunizes the tobacco plant against the latter. Cross immunity was also found between the two streak strains and two other strains of tomato streak, and between them and tobacco virus.

Filtration through graded collodion membranes indicated that the two strains have different filtration end-points (approximating 0·086 μ and 0·16 μ average pore diameter for the green and yellow strains, respectively) and can therefore be separated by this means. This difference in filterability is probably a quantitative effect and cannot yet be attributed to a difference in particle size. The fact that the yellow strain produced local yellow spots on mature tobacco leaves suggests that chlorophyll is actually attacked by it, and that the formation of the chlorotic spots is not merely due to inhibition of plastid formation [cf. ibid., xii, p. 525].

The work further showed that the virus of tomato streak and that of tobacco mosaic can easily be transmitted to healthy susceptible plants

by spraying them with a suspension of these viruses from an atomizer [ibid., xiii, p. 328], a fact which may in time lead to the discovery of a method of virus transmission hitherto unsuspected, apart from insect vectors or accidental contamination.

SHAPOVALOV (M.). **Effect of certain chemicals on the 'combination streak' virus of Tomatoes.**—*Phytopathology*, xxv, 9, pp. 864–874, 1935.

A number of chemical substances, known to produce a strong lytic action on certain micro-organisms, were added to unfiltered tomato juices containing the 'combination streak' virus [*R.A.M.*, xiv, p. 661] and left for two hours, after which the juices were applied to healthy young tomato plants and the results evaluated in comparison with the controls inoculated with untreated juices, the latter showing 100 per cent. infection in four to five days.

The following in ascending order of efficacy produced decided lytic effect on both components of the streak, of which B (latent potato mosaic) [ibid., xiv, p. 782] generally proved the weaker: the unconjugated bile acids, copper sulphate, potassium hydrogen sulphate, sodium salicylate, iodine suspensoid, antimony sulphate, bismuth sulphate, and sulphurous acid, the last-named being effective at relatively low concentrations (1·5 to 3 per cent.). Cobalt, nickel, and zinc sulphates (especially the first two) also exerted a lytic action on both components of the streak complex, but unlike the foregoing substances, they were not appreciably more toxic to B than to A (Johnson's tobacco mosaic virus No. 1) [see preceding abstract].

SHAPOVALOV (M.). **Graft versus insect transmissions of curly top in Tomatoes (Tomato yellows).**—*Phytopathology*, xxv, 9, pp. 844–853, 1 fig., 1 diag., 1935.

A tabulated account is given of the writer's experiments in California in the transmission of curly top (yellows) of tomato by grafting [*R.A.M.*, xiv, p. 202], from which it is evident that this method cannot effectively replace the standard procedure of inoculation with viruliferous leafhoppers (*Eutettix tenella*). The infection of one of a pair of approach-grafted tomato plants with the curly top virus does not guarantee the passage of the latter to the second grafted plant, the failure of which to contract the disease from the infected individual through the graft union occurs even when grafting and inoculations are made simultaneously and is much more likely when grafting is delayed five or six days, while no advantage was secured by advance grafting. The insect-inoculated shoot or scion may fail not only to transmit the disease to the healthy plant on which it is grafted, but may recover completely from all curly top symptoms after severance from its mother plant or stock below the graft union, or may never develop the symptoms at all. Similarly the stock, severed from a diseased scion, may fail to show any curly top symptoms or may recover from the disease, although the scion may continue to develop the symptoms and transmit them to the healthy plant on which it is grafted. The number of recoveries among the stocks of the inoculated plants was considerably larger than among the scions severed from them.

McClean (A. P. D.). **Further investigations on the bunchy top disease of Tomato.**—*Sci. Bull. Dep. Agric. S. Afr.* 139, 36 pp., 10 pl., 1935.

The following items in this fully tabulated account of the writer's continued investigations on bunchy top of tomato in South Africa are of interest in addition to those already noticed from another source [*R.A.M.*, xiv, p. 799].

The virus is rapidly destroyed by ten minutes' exposure to temperatures above 70° C. and partially inactivated at 60° to 70°; below 60° it was not appreciably affected. It lives for a comparatively short time in extracted juice, dying out rapidly after twelve hours, but was not appreciably reduced in virulence when subjected to an hour's contact with 30 per cent. alcohol. Within its hosts the bunchy top virus persists in an active state for lengthy periods, being recovered after $2\frac{1}{2}$ years, for instance, from *Solanum diplosinuatum*. There was some evidence that passage through tobacco increases the virulence of the infective principle.

Bunchy top was experimentally transmitted to *Lycopersicum pimpinellifolium* and *Zinnia elegans*, besides the plants previously mentioned. The various hosts do not acquire infection with equal readiness by artificial methods. *Nicandra physaloides*, *Physalis peruviana*, *P. viscosa*, and others were infected easily by mechanical means, whereas *S. aculeastrum* was only infected once, and that by grafting. Tobacco was infected readily by grafting but not by mechanical inoculation. *Datura stramonium* appeared to be immune. In their reaction to the bunchy top virus, these species, apart from *P. peruviana*, remained normal in appearance or showed changes of a comparatively mild form, the most important effect of the virus being to retard the rate and amount of growth. The so-called 'severe disease' of *P. peruviana*, which developed spontaneously in two individuals and is substantially identical with bunchy top, is not yet clearly understood, though it appears to be definitely associated with the presence of the bunchy top virus—normally comparatively innocuous to this species. 'Severe disease' was artificially transmitted by mechanical means and grafting from *P. peruviana* to the same host and tomato and from the latter back to *P. peruviana*. Bunchy top was readily induced in tomato by inoculation back from other Solanaceae, though the symptoms did not in general develop quite so rapidly as when tomato itself was the source of the inoculum.

Hutchinson (W. G.). **Resistance of Pinus sylvestris to a gall-forming Peridermium.**—*Phytopathology*, xxv, 9, pp. 819–843, 3 figs., 1 diag., 1935.

No correlation was observed between resistance to infection by the 'Woodgate rust' (*Peridermium* sp. or, according to Arthur, an autoecious form of *Cronartium quercuum*) [*R.A.M.*, xii, p. 733; xv, p. 63] and any morphological feature of the individuals remaining immune from natural contamination and artificial inoculation during six consecutive years in the Woodgate district of New York. The inoculated trees showed three general types of reaction: (1) typical gall formation (susceptible); (2) cracking of bark and slight resinosis, sometimes followed by the formation of atypical galls (partial resistance); and (3) formation of small necrotic areas on the twigs, sometimes followed

by swellings remaining stationary in size after the first or second year and being gradually sloughed off (resistance). In the case of (1) the active growth of the mycelium in the host, involving a semi-mutualistic relationship, results in the stimulation of living cells and gall formation. In (2) the mycelium grows as far as the wound cork and may break through it and perhaps a second and a third cork layer before finally disintegrating. If the mycelium gets a foothold and is no longer checked, a gall may be developed but is often aborted or atypical. Necrotic areas are exfoliated and there may be a swelling of the stem due to the cambium being stimulated to form quantities of wound wood, including tangentially enlarged tracheids, giant cells, and tyloses in the tracheids, and resin ducts. In (3) the host cells are killed immediately after invasion, possibly by the liberation of toxin through the haustoria, and the fungus, deprived of its food supply, quickly dies, leaving the necrotic area, surrounded by cork and later by sclerenchyma, to be sloughed off. Both in resistant and susceptible trees the earliest invaded cells may become filled with tannin, a reaction possibly representing a form of local immunity.

No correlation was detected between the osmotic pressure or hydrogen-ion concentration of the cell sap and resistance, but there is some indication that this property may be connected with nutritional factors, a larger amount of potassium having been found in non-infected than in susceptible stems.

BUISMAN (C[HRISTINE]). **Sensibilité de diverses espèces et variétés d'Orme à Ceratostomella ulmi.** [Susceptibility of different species and varieties of Elm to *Ceratostomella ulmi.*]—*Rev. Path. vég.*, xxii, 3, pp. 200–208, 1935.

Further investigations in Holland into the reaction of different elm species and varieties to *Ceratostomella ulmi* [*R.A.M.*, xiv, p. 726 and next abstracts] showed that the following Asiatic species were moderately resistant, though without importance economically: *Ulmus wilsoniana* [cf. loc. cit.], *U. macrocarpa*, *U. parvifolia*, *U. shirasawana*, *U. sieboldii*, and *U. sieboldii* var. *coreana*. Of all the species and varieties tested *U. pumila* and its var. *pinnato-ramosa* are the most resistant, but under Dutch conditions the former is susceptible to *Nectria cinnabarina* [ibid., xiv, p. 665]. No elm has yet been found which can suitably replace *U. hollandica belgica* in Holland.

In attempts to find the most resistant individuals among seedlings of the best European species, hundreds of seedlings of *U. foliacea*, *U. glabra*, and *U. laevis* were inoculated with *C. ulmi*, the infected seedlings eliminated, and the remainder reinoculated, sometimes as frequently as thrice in one summer. These experiments were continued for several successive years, branches from the most satisfactory seedlings that showed resistance being grafted on to *U. hollandica belgica*. The scions found insufficiently resistant on further inoculation were eliminated.

As a result the author now possesses a few seedlings of *U. foliacea* and two of *U. glabra* which are highly resistant, one seedling of the former species from Spain, no. 24, combining very marked resistance with a vigorous growth habit. Scions of this are being studied and

grafts have been distributed to growers for propagation but their sale will not be permitted for two or three years. Layers from it are also being grown and submitted to additional inoculation. Further tests of seedlings are also being made, chiefly of *U. foliacea,* since only very few resistant individuals occur in seedlings of *U. glabra* and *U. laevis.*

FRANSEN (J. J.). **Onderzoekingen over de Iepenziekte verricht aan het Laboratorium voor Entomologie te Wageningen in 1934.** [Investigations on the Elm disease conducted at the Laboratory for Entomology at Wageningen in 1934.]—*Tijdschr. PlZiekt.*, xli, 9, pp. 240–260, 1935.

Observations at Utrecht are stated to have shown that *Graphium* [*Ceratostomella*] *ulmi* [see preceding and next abstracts] is capable of persisting for four years in a quiescent state in elm trees before breaking out in epidemic form in the entire absence of bark beetles (*Scolytus scolytus* and *S. multistriatus*) [see next abstract]. Similar reports have been received from C. May in the United States. Some evidence was obtained that the mite *Pseudotarsonemoides innumerabilis* is concerned in the transmission of the fungus [*R.A.M.*, xiv, p. 665].

FRANSEN (J. J.) & BUISMAN (CHRISTINE). **Infectieproeven op verschillende Iepensoorten met behulp van Iepenspintkevers.** [Inoculation tests on various Elm species with the aid of Elm bark beetles.] —*Tijdschr. PlZiekt.*, xli, 9, pp. 221–239, 1 pl., 1935.

Observations having shown that elm bark beetles (*Scolytus scolytus* and *S. multistriatus*) taken at random from trees attacked by *Graphium* [*Ceratostomella*] *ulmi* [see preceding abstracts] are not necessarily infected to any appreciable extent by the spores of the fungus, various methods of artificial infection were devised [*R.A.M.*, xiv, p. 665]. Of these the most satisfactory consisted in placing the insects in Petri dishes between felt mats soaked in cherry juice on which *C. ulmi* had been cultured, the mats being kept apart by an iron ring. A strip of cheese-cloth, below which the beetles were released, was affixed to every one of the 20 to 24 trees used in each of the four experiments. In three out of four trials the trees were also inoculated directly with *C. ulmi*.

The results of the tests, which were carried out between 30th May and 17th July, 1934, at Haarlem and Amersfoort, are tabulated and discussed. The July inoculations produced few infections, probably owing to seasonal factors, since the activity of the beetles, shown by the number of feeding places in the bark, was considerable at this time. The insects fed on all the trees on which they were placed, causing definite symptoms of die-back on *Ulmus glabra fastigiata*, two strains of *U. foliacea*, *U. hollandica belgica*, and the Karagatch elm. Of these the first-named is normally resistant, being probably avoided by the beetles owing to the tendency of the injured bark to exude large quantities of sap. Of the trees inoculated in the ordinary way, *U. glabra fastigiata*, one strain of *U. foliacea*, and *U. hollandica belgica* contracted infection, the results with the other strain of *U. foliacea* and the Karagatch elm being inconclusive. A considerable degree of resistance was shown by *U. wilsoniana*, *U. pumila pinnato-ramosa*, and *U. macrocarpa*. *C. ulmi* was reisolated from 32 out of 36 sections of branches

fed on by the artificially inoculated beetles, the corresponding numbers for the material exposed to insects collected haphazard from the bark being only 11 out of 32. These data are regarded as clearly showing the importance of the elm bark beetles in the transmission of *C. ulmi*.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, vii, 8, pp. 169–171, 172–174, 1935.

HOLLAND. An Order of 9th May, 1935, provides for the immediate inspection by the Plant Protection Service of any field plot bearing potatoes suspected of infection by wart disease (*Synchytrium endobioticum*). Potatoes infected by wart disease or grown in contravention of the provisions herein laid down (respecting the cultivation of immune varieties, restriction to certain localities, and the like) may not be moved or exported.

U.S.S.R. An Order of the Agricultural Commissariat of Plant Protection of 22nd April, 1935, prohibits the importation from foreign countries of all kinds of vegetables and root crops, such as potatoes, sweet potatoes, carrots, and beets, with the exception of fresh 'table vegetables' (cut and freed from roots and soil), to be examined at the frontier, for the use of embassies and legations. A Verbal Note of the People's Commissariat for Foreign Affairs of 22nd July, 1935, permits the importation of vegetables from abroad into Saghalien and Kamschatka until 1937 and into Primorié during 1935 on condition of accompaniment by an official certificate vouching for the freedom of the consignments from pests and diseases in general and for the absence of wart disease during the last six years within a radius of 20 km. of the place of growth of the imported potatoes and other vegetables.

Government of Palestine. Plant Protection Ordinance, 1924. Order No. 129 of 1935, by the Officer Administering the Government under section 3.—8 pp., 1935.

Schedule I of the Plant Protection Order (No. 2) 1934, Amendment Order, 1935, dated 5th September, 1935, prohibits, except under official authorization for scientific purposes, the importation into Palestine [*R.A.M.*, xiv, p. 544], in addition to items previously mentioned, of all species of citrus other than citrus fruits from Egypt, Syria, or Cyprus, mango other than fruit being the *bona fide* produce of Egypt, avocado pears, papaws, custard apples (*Anona* spp.), figs (all species of *Ficus*), pomegranate (plants only), guava (plants only), mulberry (plants only), palms except date palm fruit, cotton (except ginned), and all species of *Hibiscus*. Under Schedule II properly authenticated certificates of freedom from disease in general and from certain disorders in particular are required in the case of vine (court-noué or arricciamento) [ibid., xiv, p. 675] and Egyptian mango fruit (*Bacillus mangiferae*), besides others previously stipulated. Schedule III provides that citrus nursery stock and budwood and mango stock or budwood imported under special permit for scientific or experimental purposes shall be accompanied by a certificate of freedom from disease in general and in particular from *Pseudomonas citri* and *Sphaceloma fawcettii* in the case of citrus and from *B. mangiferae* in that of mango.

Special regulations, effective as from 1st October, 1935, are hereby introduced for the importation of seed potatoes. All seed potatoes are to be imported only through the ports of Jaffa or Haifa, and every consignment must be accompanied by (*a*) a certificate stating that the produce was not grown in land infested by wart disease (*Synchytrium endobioticum*), and (*b*) that it is free from wart disease, powdery and common scabs (*Spongospora subterranea* and *Actinomyces scabies*, respectively, up to 10 per cent. infection by each of which is tolerated, however, provided the surface area of the tubers so infected does not exceed 10 per cent.), and blackleg (*Bacillus phytophthorus*).

A Proclamation. The Plant Protection Ordinance, 1935.—*St. Vincent. Govt Gaz.*, lxviii, 45 (Extraordinary), pp. 249–251, 1935.

Under section 4 of the Plant Protection Ordinance, No. 14 of 1935, the Administrator of the Island of Saint Vincent and its Dependencies prohibits, as from 1st August, 1935, the importation into the Colony of the following: (*a*) soil; (*b*) packages for cotton seed, seed cotton, cotton lint, or cotton seed meal; (*c*) plants, fruits, seeds, cuttings, or other parts of cotton, citrus (except fruit of orange and grapefruit from British West Indian Islands), sugar-cane, coffee (except from the British West Indian Islands), banana, plantain, or other *Musa* spp., cacao, coco-nut, sweet potatoes, cassava, arrowroot [*Maranta arundinacea*], *Hevea* [*brasiliensis*], nutmegs, and ground-nuts; (*d*) fruits and vegetables not specied in paragraph (*c*), except from the British Isles, Canada, the United States, and the British West Indies (excluding Bermuda, Jamaica, the Bahamas, and British Guiana) from which countries a certificate of origin is required, this restriction not being applicable to nuts, processed fruits, and vegetables, onions, and potatoes.

As from 1st September, 1935, no plants or parts thereof (except manufactured or processed products, nuts, onions, potatoes, garden seeds, and the fruit of orange or grapefruit) may be imported into the Colony without a health certificate (a form of which is appended) except at the discretion of the Agricultural Authority, who may also import any plant material if obtained with the approval of the Committee of the Plant Quarantine Station, Trinidad.

The following are declared to be 'proclaimed diseases' within the meaning of the Ordinance [which empowers the Agricultural Authority to quarantine nurseries within 20 yds. of plants infected by such diseases]: bud rot [*Phytophthora palmivora*: *R.A.M.*, xv, p. 15] and little leaf of coco-nut, mosaic of sugar-cane, wither-tip of lime [*Gloeosporium limetticolum*: ibid., xiv, pp. 84, 146], Panama and 'moko' diseases of the banana [*Fusarium oxysporum cubense* and *Bacterium solanacearum*: ibid., xiv, p. 181; xv, p. 64] (the former also being a 'notifiable disease', except in such areas as may be declared to be 'Panama disease-infected areas'), and burning disease [*Rosellinia* (?) *bunodes*: ibid., xiii, p. 74] of arrowroot [*M. arundinacea*].

Under section 27 of the Plant Protection Ordinance, 1935, the removal from the 'Panama disease-infected areas', comprising the Parishes of St. George and that part of the Parish of Charlotte lying to the south of the Coronarie river, of any part or parts of banana plants, including the fruit and trash, to any other part of the Colony is prohibited.

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XV | MARCH | 1936

GOIDÀNICH (G.). **Le alterazioni cromatiche parassitarie del legname in Italia.** [Staining of timber in Italy.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, pp. 363–388, 1 fig., 1935.

In this paper (which is intended to serve as an introduction to a forthcoming account of his own researches on the subject) the author reviews the history of earlier investigations into timber-staining fungi, discusses the causes that produce staining (i.e., colour of the hyphae themselves, pigments produced by the fungi, and pathological effects on the tissues), and gives notes on the biology of the fungi concerned and their genera and species. He considers that the organisms causing tracheomycosis (e.g., *Verticillium albo-atrum* and *Graphium* [*Ceratostomella*] *ulmi*) [see next abstracts] should be regarded as staining fungi, as, apart from the anatomical characters of the infected tissues, the effects produced by these fungi amount to staining.

Species of *Ophiostoma* [*R.A.M.*, xiv, p. 703] have been isolated from oak near Rome, causing a dark brown discoloration due to the numerous tyloses formed in the tracheids. The author considers that the tyloses act as a mechanical barrier against the advance of hyphae, and at the same time by shutting off the access of air and water to the vessels they set up conditions which render the continued existence of the parasite impossible.

The paper concludes with an account of the part played by insects in the transmission of staining fungi and a brief discussion of the amount of damage caused by the latter.

WORTHLEY (L. H.) & LIMING (O. N.). **Dutch Elm disease eradication in the United States.**—*J. econ. Ent.*, xxviii, 3, pp. 524–528, 1935.

After giving a brief outline of the history of the Dutch elm disease (*Ceratostomella ulmi*) [*R.A.M.*, xv, p. 126] in Europe and of its discovery in the United States, as well as a concise account of its symptoms, the author states that recent investigations have shown the existence of over 7,600 elms affected with it in the major infection centres in New Jersey, New York, and Connecticut [ibid., xiv, p. 406]. Isolated infected trees have also been found in Cleveland, Cincinnati, Baltimore, Indianapolis, Norfolk, and Old Lyme, Connecticut. The elm bark beetle *Scolytus multistriatus* has been collected from the general

area east of Harrisburg, Pennsylvania, north of the New Jersey-Delaware State line, and south of the Massachusetts-Vermont State line, while the American bark beetle, *Hylurgopinus rufipes*, with habits somewhat similar to those of *Scolytus*, occurs throughout the northern elm area in the United States; other insects may also be involved in the transmission of the disease. *S. scolytus* is not known to be established in the United States.

Some details are given of the work now in progress for the eradication of the Dutch elm disease from the United States, as well as of plans for the future.

Beattie (R. K.). **Research during 1934 on Ceratostomella ulmi, the cause of the Dutch Elm disease.**—*J. econ. Ent.*, xxviii, 3, pp. 528–531, 1935.

The author states that researches in 1934 tended to confirm the hypothesis that the Dutch elm disease (*Ceratostomella ulmi*) [see preceding abstract] was introduced into the United States with shipments of elm logs from Europe. Additional infected trees were found at Cleveland and Indianapolis, all more or less in the proximity of veneer factories using European elm material, or of railways transporting imported elm logs from the ports of entry. The facts that the trees at Cleveland were found to contain the fungus in annual rings starting with that formed in 1929, and one of the trees from Indianapolis showed the organism in its 1926 annual ring would indicate that these trees were first infected in those years, since there is no evidence that the *Graphium* may spread from a younger to an older ring. The 1926 infection in Indianapolis is the oldest yet discovered in America. A possible explanation of the position in Indianopolis may be the presence in the region of a few undiscovered *Scolytus* beetles transmitting the disease, although the vicinity is reputed to be free from these beetles.

Apart from elm logs the possibility also exists of the disease having been imported into the United States with cheap crockery which, in certain parts of Staffordshire, England, is packed in crates made of unbarked wood of miscellaneous trees, including elm; five out of fifteen such crates showed on arrival in New York brown streaks in the young wood and contained living larvae of *S. multistriatus*, but attempts to isolate *Graphium* from the wood were unsuccessful. During 1934 specimens from 16,872 suspected elm trees were examined and of these 49 per cent. gave cultures of *Graphium*, 33 per cent. yielded a *Cephalosporium*, and 4 per cent. a *Verticillium*.

Roy (A.). **La Corse forestière.** [Sylvan Corsica.]—15 pp., 2 pl., 1 map, *Bull. Com. For., Paris*, June, 1935. [Abs. in *Rev. Eaux For.*, lxxiii, 6, p. 552; 10, p. 930, 1935.]

In connexion with a general study of Corsican silviculture it is stated that the wild chestnuts occurring sporadically in the forests situated on mountain slopes have so far remained entirely free from the ink disease [*Phytophthora cambivora*: *R.A.M.*, viii, p. 151; xiv, p. 264] which is devastating the valley plantings.

MÜNCH (E.). **Das Lärchenrätsel als Rassenfrage. Zweite Mitteilung: Die Lärche im Seeklima.** [The Larch riddle as a question of strain. Second note: the Larch in the maritime climate.]—*Z. Forst- u. Jagdw.*, lxvii, 8, pp. 421–442; 9, pp. 483–500, 7 figs., 1935.

This is a very comprehensive and fully documented survey of the position occupied by the larch in maritime climates, with special reference to the bearing of silvicultural factors on the predisposition of the trees to the so-called 'larch disease' or 'larch die-back', a frequent but apparently quite independent concomitant of canker [*Dasyscypha willkommii*: *R.A.M.*, viii, p. 2; xiii, p. 482]. The disorder, which has been found to be most prevalent and destructive on 20- to 30-year-old trees, consists essentially in progressive desiccation of the branches, mostly from the base upwards, and may assume either a chronic or acute form, the dead and injured bark being frequently covered with a dense mass of lichens. Recovery from the disease is rare.

The careful inspection of numerous old larch stands in excellent condition has clearly shown that certain larch strains are admirably adapted to the exigencies of the maritime climate of the countries adjoining the North Sea and Baltic Sea. In Great Britain and Scandinavia the Scottish strain thrives, while for the east and north-east of Germany seed from the Sudetic Alps may be recommended, die-back among Sudetic larch stands being quite exceptional. The striking contrast between the healthy old (over 80 years) stands and the sickly younger ones that have grown up since 1880 or thereabouts is thought to be explicable by the importations of cheap seed from unfavourable localities. The use of larch seed from the Sudetic Alps or other approved sources is regarded as the sole means of maintaining the stands in a healthy condition, and should such seed not be available it would be preferable temporarily to discontinue the cultivation of the tree rather than procure planting material from the Tyrol.

RUDGE (E. A.) & LEWIS (H.). **An inquiry into the mechanism of decay of wood. Part II.**—*J. Soc. chem. Ind., Lond.*, liv, 36, pp. 302 T–305 T, 1935.

Analytical determinations [the data of which are tabulated and discussed] of the major constituents (cellulose, 'hemicelluloses', and lignin) of spruce, tulip wood [*Liriodendron tulipifera*], and elm samples treated with water, calcium carbonate, or carbon dioxide at 65° C. showed the chief symptoms of incipient decay by infiltration (as distinct from that of fungal origin) [*R.A.M.*, xiv, p. 668 and next abstract] to be an increase of alkali-soluble matter, accompanied by a decrease of cellulose and lignin. The degradation of the water-treated wood may be partially attributable to the presence of calcium salts in the tissues themselves, especially those of elm, which suffered the heaviest damage from this treatment. The practical implications arising out of these results are discussed in some detail.

NORMAN (A. G.). **The mechanism of decay in wood.**—*J. Soc. chem. Ind., Lond.*, liv. 38, pp. 854–855, 1935.

After criticizing the experimental methods used by Rudge in his attempt to prove that decay in wood is an accompaniment of mineral

infiltrations [see preceding abstract], the writer sums up as follows the present position of the controversy between the adherents of this theory and the professional wood chemists. Rudge has clearly demonstrated the accumulation in many different samples of decayed wood of inorganic salts, especially calcium and aluminium, but has furnished no evidence that this process is intimately connected with genuine decay under conditions absolutely precluding microbiological involvement. There is nothing to show that the infiltration is not a secondary process, and the presence of calcium salts may, in fact, even assist the progress of biological decay by neutralizing the organic acids commonly formed by wood-destroying fungi. It is concluded that, in the absence of direct proof of purely chemical action by inorganic salts at ordinary temperatures, the infiltration theory cannot supersede the orthodox biological explanation of wood decay, or even be accepted as complementary to the latter.

RUST (S. F.). **Some aspects of wood preservation in Australia and U.S.A.** —*J. Brit. Wood Pres. Ass.*, v, pp. 43–68, 1935.

In the first part of this paper, which was read at a meeting in 1935 of the British Wood Preserving Association, the author states that owing to the high degree of natural resistance to decay of the great bulk of timber grown in Australia, wood preservation with coal tar creosote under high pressure has not been employed so far on a commercial scale in the Commonwealth. The comparatively small proportion of the timber that has been subjected to preservation until now was treated either by the 'Powellizing' [*R.A.M.*, viii, p. 80; xi, p. 686] or by the fluorizing process (i.e., boiling the green timber in a solution of sodium fluoride, arsenious oxide, and sodium dinitrophenate) [ibid., xi, p. 617], although earlier superficial treatment by dipping in, or brushing with, creosote, or charring had been applied [ibid., xiv, p. 806]. The standard treatment of poles by the postal authorities is to brush the poles 12 to 18 in. above and below soil level with Stockholm tar, gas tar, and slaked lime (3–7–3). The persistent demand for industrial timber, however, as instanced by the fact that the annual replacements of poles and railway sleepers alone involve a sum in excess of £1,000,000, coupled with the depletion in decay-resisting timber supplies, is increasingly drawing attention to the wood preservation problem in Australia. At present service tests of timbers and treatments are being carried out, and the preservative values of Australian creosotes are being ascertained; analyses of the oil are made according to the standard methods of the American Wood Preservers' Association, and a tentative specification has been prepared and published. Four years' service tests of fluorized sleepers have shown 99·1 per cent. to be still in good condition, compared with only 62 per cent. for the controls. The treatment of fence posts [loc. cit.] with creosote plus crude oil or zinc chloride plus arsenic resulted in sound posts after 3½ years, while the controls were badly decayed. In posts treated with sodium fluoride and arsenic the decay increased with the rainfall.

In the second part a brief review is made of the wood preservation methods observed by the writer during his tour through the United States [most of which have been noticed from time to time in this *Review*].

Thomas (A. V.). **Wood preservation in Malaya.**—*J. Brit. Wood Pres. Ass.*, v, pp. 76–78, 1935.

This is an abridged version of the author's recent report on the wood preservation methods used in Malaya [*R.A.M.*, xiv, p. 484].

Harkom (J. F.). **Cross-ties used by Canadian railways.**—*J. Brit. Wood Pres. Ass.*, v, pp. 79–88, 2 pl., 1935.

After a brief indication of the climatic and other environmental conditions to which railway sleepers are subjected in Canada, the author gives details of their production in that Dominion, including preservation. Apart from a limited number treated with zinc chloride, which are destined for use in Alberta and Saskatchewan, the sleepers are usually treated at present in the east with a mixture consisting of 70 per cent. creosote and 30 per cent. tar, and in the west with a mixture of 70 to 50 per cent. creosote and 30 to 50 per cent. crude oil. Since the adoption of the incising process of the sleepers [ibid., xii, p. 342], the net absorption was reduced from 8 to 10 lb. per cu. ft. before 1924 to 6 lb., but some plants still keep it at 8 lb., the general custom being to increase the net absorption by at least 1 lb. when using the 50–50 creosote-crude oil mixture. Treating schedules for the different species of timber used in Canada are shown in a table. A list is also given of the percentages of sleepers laid down which were treated in the years from 1922 (16·7) to 1932 (33·1), with a maximum in 1931 (38·7), the average cost per sleeper varying from $1·59 to $1·36 for the treated to $0·753 to $0·634 for the untreated. The service life of the sleepers is estimated to have been increased by treatment from 3 to 4 years for beech, yellow birch [*Betula lutea*], and hard maple [*Acer saccharum* and *A. nigrum*], 5 to 6 years for red oak [*Quercus rubra*], 4 to 7 for hemlock [*Tsuga canadensis*], and 5 to 8 for jack pine [*Pinus banksiana*] sleepers to 18 to 20, 15 to 25, 15 to 20, and 15 to 20 years, respectively.

Findlay (W. P. K.). **A standard laboratory test for wood preservatives.**—*J. Brit. Wood Pres. Ass.*, v, pp. 89–93, 1935.

This is an abridged description of the 'gravimetric' method which was recommended for testing wood preservatives at the International Conference of Mycologists and Wood Preservation Technicians in 1930 at Berlin, an account of which has already been noticed from another source [*R.A.M.*, xiv, p. 411].

Palm (B. T.). **Rumex acetosella, spontan värdväxt för Bacterium (Pseudomonas) tumefaciens.** [*Rumex acetosella*, a spontaneous host of *Bacterium* (*Pseudomonas*) *tumefaciens*.]—*Svensk bot. Tidskr.*, xxviii, 4, pp. 465–467, 1 fig., 1934. [English summary. Received November, 1935.]

The annual sporadic occurrence of crown gall (*Bacterium tumefaciens*) on sugar beets [*R.A.M.*, xiv, p. 686] in southern Sweden is stated to be of no economic importance, so that the recent detection of the pathogen on *Rumex acetosella*, a common weed on acid soils, in several localities of Scania is of purely scientific interest. Inoculation experiments with the organism from *R. acetosella* on the roots of the current

season's plants gave positive results in 4 out of 20 cases, the corresponding figures for the young lateral branches of seed beets being 5 out of 10. Similar galls were observed on *Campanula rotundifolia* growing near the affected *Rumex* plants in one district.

PIERCE (W. H.). **The inheritance of resistance to common Bean mosaic in field and garden Beans.**—*Phytopathology*, xxv, 9, pp. 875–883, 2 figs., 1935.

A tabulated account is given of the writer's studies at the Idaho Agricultural Experiment Station on the inheritance of resistance to common bean [*Phaseolus vulgaris*] mosaic [*R.A.M.*, xiv, p. 810] in crosses involving three resistant varieties, viz., Corbett Refugee, Robust, and Great Northern UI No. 1, and one susceptible, Refugee Green.

All hybrids derived from Corbett Refugee showed resistance to the disease in the F_1 generation, whereas the F_1 progeny of crosses of Great Northern UI No. 1 and Robust with Refugee Green were susceptible. In the F_2 generation the Corbett Refugee×Refugee Green hybrids segregated 89 per cent. resistant plants when the former was used as the male parent, 82 per cent. resistant being yielded by the reciprocal cross. The F_2 progenies of Great Northern UI No. 1× Refugee Green segregated 15 to 18 per cent. resistant plants, and Robust×Refugee Green 12 per cent. Crosses between certain resistant varieties segregated susceptible plants in the F_2 generation—Corbett Refugee×Great Northern UI No. 1, 11·4 per cent. and Corbett Refugee ×Robust, 20·8. Great Northern UI No. 1×Robust did not segregate in the F_2, indicating that the resistance of these two varieties is of a similar type. Back-crossing tests to Refugee Green with two homozygous resistant varieties, Idaho Refugee and Wisconsin Refugee, selected from the Refugee Green×Corbett Refugee cross, showed them to possess the same degree of resistance as the original resistant parent, Corbett Refugee.

The data from these inheritance trials were sufficiently consistent to admit of fairly accurate predictions as to the performance of crosses between resistant and other varieties.

CURZI (M.). **'Dematophora glomerata' Viala e 'Vialina' n.gen.** [*Dematophora glomerata* Viala and *Vialina* n.gen.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 2, pp. 235–259, 9 figs., 1935. [English summary.]

In this revised and expanded account of his investigations into the specific complexity of *Dematophora glomerata* [*R.A.M.*, xiv, p. 195] the author identifies the sclerotial form mentioned by Viala with *Microascus intermedius* Emmons & Dodge (*Mycologia*, xxiii, p. 324, 1931), and names the pycnidial form [with Latin diagnoses of the genus and species] *Vialina glomerata* n.gen., n.sp. (= *D. glomerata* p.p.). The genus resembles *Chaetasbolisia* Speg. but differs from it in having hairy instead of setulose pycnidia. In culture the dark hyphae of *V. glomerata* measure 1·5 to 3·5 μ in diameter as against 2 to 2·75 μ on the host. The sparse, globose or spherical, fuliginous to black pycnidia, 100 to 250 μ in diameter, have a thin hairy wall and a minute, impressed ostiole. The pycnospores [*R.A.M.*, xiv, p. 196] arise at the

apex of cylindrical or conical sporophores or directly from the wall of the pycnidium. Inoculation tests on vine plants in 1932 and 1933 indicated that the fungus does not cause disease and is probably only a soil saprophyte.

Roots of *Chrysanthemum cinerariaefolium* affected by a rot previously described [ibid., xiii, p. 396] showed the presence of the mycelium of a *Vialina* with chestnut or fuliginous, branched hyphae 2 to 3 μ in diameter, with piriform swellings 3·75 to 7·5 μ thick at the septa. The fungus formed clusters of uni- or pluricellular chlamydospore-like bodies 5 to 10 μ in diameter. The superficial, globulose, sometimes aggregated, hairy, ostiolate pycnidia measured 150 to 300 μ in diameter and the cylindrical, hyaline, continuous pycnospores 4·75 to 5·75 by 2 μ. The fungus is named *V. radicicola* n.sp. [with a Latin diagnosis].

Faes (H.). **Station fédérale d'essais viticoles à Lausanne et Domaine de Pully. Rapport annuel 1934.** [Annual report for 1934 of the Federal Viticultural Experiment Station at Lausanne and Domaine de Pully.]—*Landw. Jb. Schweiz*, xlix, 6, pp. 619–664, 13 figs., 1 graph, 1935.

This report contains a number of items of phytopathological interest [cf. *R.A.M.*, xiii, p. 77], of which the following may be mentioned. Indisputable evidence was obtained of the efficacy of late (August–September) applications of copper-containing preparations in the control of apple scab (*Venturia*) [*inaequalis*], delayed attacks of which were favoured by the September dews [ibid., xiv, p. 111]. These compounds, however, are liable to cause severe burning of the foliage and russeting of the fruits [ibid., xv, p. 73], the keeping quality of certain varieties of which is thereby impaired.

The best control of the *Fusarium* disease of China asters [*Callistephus chinensis*: see below, p. 156] in a market-garden was given by soil sterilization with formalin 15 days before sowing. Promising results were also given by experiments in steam sterilization of the soil.

At Belle-Ferme near Payerne the incidence of heart rot of beets was reduced from 15 to a maximum of 3 per cent. by the incorporation of boric acid or borax with the soil [see below, p. 190].

Copper carbonate, ceretan [ceresan], and tillantin R dusts were the most satisfactory of various substances used for the general disinfection of spinach, peas, bean [*Phaseolus vulgaris*], lettuce, tomato, celery, onion, cabbage, carrot, and beet seeds [ibid., xiii, p. 609].

Good control of *Rhizoctonia* [*Sclerotium*] *tuliparum* [ibid., xiii, p. 493] on tulip, hyacinth, and narcissus was given by three hours' immersion of the bulbs in 1 per cent. formalin or 0·5 per cent. uspulun at 44° C.

Desai (S. V.). **Phytopathology.**—*Biochem. Res. India 1934*, pp. 53–60, 1935.

The results of studies on some important phytopathological problems in India carried out during 1934 are briefly reported. All the investigations mentioned have been noticed in this *Review* from other sources.

Park (M.). **Report on the work of the Mycological Division.**—*Adm. Rep. Dir. Agric., Ceylon, 1934*, pp. D124–D131, 1935.

This report [*R.A.M.*, xiv, p. 145] contains, *inter alia*, the following items of phytopathological interest.

In the wetter parts of Ceylon, particularly on those estates where control measures were neglected during the financial depression, *Fomes lignosus* and *Ustulina zonata* [ibid., xiii, p. 593] continue to attack *Hevea* rubber.

In one locality, young chilli [*Capsicum annuum*] plants were widely attacked by *Cercospora capsici* [ibid., xi, pp. 605, 804], this being the first definite record of the disease in Ceylon; in another district the same host was attacked by little leaf [ibid., xii, p. 77]. The latter condition is marked by an abundant production of dwarf leaves, badly affected plants often dying back. Diseased plants seldom fruit, and when they do the fruits produced are small and distorted. That the disease may be due to a virus was indicated by the presence of similar symptoms on *Solanum nigrum* and *S.* (?) *laeve* in the vicinity. The severity of the outbreak, which affected nearly 100 per cent. of the plants over an area of five acres, is attributed to an insufficiently long rotation period.

The control of citrus canker (*Pseudomonas citri*) [ibid., xiv, p. 145] continues to be a major problem in the development of citrus, and especially of grapefruit, plantations. The attempt at control begun in 1933 by systematic spraying and removal of all affected parts was continued with satisfactory results. A similar trial was conducted in 1934 on 94 four-year-old grapefruit trees. The first collection of diseased leaves necessitated almost stripping the trees bare. Spraying was carried out with lime-sulphur and with soap-colloidal sulphur-nicotine and with the advent of the rains the trees recovered. The results of the two experiments indicate that by the systematic destruction of all diseased material combined with thorough spraying the incidence of grapefruit canker caused by *P. citri* can be so reduced as no longer to occasion alarm.

Citrus mildew (*Oidium tingitaninum*) [ibid., xii, p. 689; xiv, p. 153] was very prevalent early in the year; the use of colloidal copper against the fungus is stated to be increasing. The fungus previously reported as causing anthracnose of young orange fruits [ibid., xiv, p. 146] was identified as a strain of *Colletotrichum gloeosporioides*. Citrus was also attacked by brown root (*Fomes lamaoensis*) [*F. noxius*: cf. ibid., xv, p. 78].

Bunchy top of plantains [ibid., xiii, pp. 78, 112, 642] continued to cause much damage, especially in large plantations. In one area of over 200 acres where plantains were grown as a catch crop in a re-afforestation scheme, 90 per cent. of the clumps were estimated to be diseased four years after planting, many of the suckers used being already diseased when planted.

Further infections of coco-nuts by leaf-bitten disease [ibid., xv, p. 15] were noted, but the prompt application of control measures arrested further progress. Wound inoculations with pure cultures of *Thielaviopsis* [*Ceratostomella*] *paradoxa* at the base of the youngest unfolding

leaf gave positive results in five days; infection, however, was localized, and did not involve the bud. No infection occurred in unwounded, inoculated leaves. When an aqueous spore suspension of the fungus was injected into a point near the bud, infection developed in two days and spread rapidly. The young leaves soon wilted, and the tree gave every indication of being infected with bud rot [*Phytophthora palmivora*: ibid., xiii, p. 79; xv, p. 15]; the advent of dry weather checked any further progress of the disease, and the tree made a good recovery.

Attempts were made to control the coco-nut beetle *Oryctes rhinoceros* by using traps infected with the insectivorous fungus *Metarrhizium anisopliae* [ibid., xiii, p. 94]; pits about 2 ft. square and 1½ ft. deep were filled with coco-nut debris plus fresh cattle dung and inoculated with cultures of the fungus on boiled rice. The fungus attacked and killed all larvae in the infected traps. Young larvae continued to appear, but soon became infected and died. On one occasion, six months after inoculation an egg was found in one trap together with young infected larvae, from which it would appear that infected traps may continue to attract the females and that one inoculation supplies infectious material for many months. Observations are being continued.

The fungus causing ginger soft rot [ibid., xiv, p. 146] was identified by S. F. Ashby as *Pythium graminicolum* [ibid., xiii, p. 494]. 'Seed' ginger treated by immersion in 0·1 per cent. mercuric chloride for two hours either just after harvesting or just before sowing yielded many more plants than untreated seed.

Other records include wet weather mould of rice (*Cladosporium* (?) *miyakei*) [ibid., xii, p. 147], rust (*Woroninella umbilicata*) of pigeon pea, *Corticium salmonicolor* on *Anona muricata*, *Pseudoperonospora cubensis* on cucumber, and *Gloeosporium musarum* and *Macrosporium musae* on *Musa cavendishii*, the four last records being new for Ceylon.

PARHAM (B. E. V.). **Annual report of general mycological and botanical work for 1934.**—*Annu. Bull. Dep. Agric. Fiji*, pp. 55–56, 1935.

In 1934, a black fruit spot appeared in tinned pineapples in Fiji, as a result of infection before picking which had not become visible until after the fruit had been processed. The connexion of the spots with the floral cavities was established, and the disease was ascertained to be associated with *Ceratostomella paradoxa*, a *Penicillium*, and a *Helminthosporium*; it was similar to the black eye spot reported from the West Indies [cf. *R.A.M.*, xiii, p. 80; xiv, p. 456]. Infection had spread from the heaps of rejected fruits left in the field to rot. Pineapple soft rot (*C. paradoxa*) [ibid., xi, p. 192; xiv, p. 455] was also noted.

A leaf and stem wilt of yams (*Dioscorea* sp.) due to *Gloeosporium pestis* Massee [ibid., ix, p. 429] caused failure of tuber production.

Yagona (*Macropiper* [*Piper*] *methysticum*) wilt, first observed in 1933, spread rapidly during 1934, when out of some 2,000 acres in the affected area 252 were destroyed by the disease and 113 severely affected. Laboratory studies resulted in the isolation of a bacterium as the probable primary cause, with a *Fusarium* and a *Neocosmospora* or a closely allied Ascomycete as secondary parasites. The primary wilt is

followed by a secondary stage characterized by leaf fall and a die-back of the ultimate shoots.

Ginger soft rot (*Pythium gracile*) [cf. ibid., x, p. 591] was recorded for the first time in Fiji.

Botany.—*Rep. Pa agric. Exp. Sta., 1934–35* (*Bull.* 320), pp. 18–21, 1 fig., 1935.

During the period under review a new pear variety, Richard Peters, was produced in Pennsylvania, which in spite of repeated inoculations has remained immune from fireblight [*Bacillus amylovorus*: cf. *R.A.M.*, xiv, p. 318]. It is very vigorous, the fruit resembling the Bartlett pear, to which it is about equal in quality; its chief value, however, is that it may become a progenitor of other resistant and better varieties. Several hundred seedlings are being grown from crosses between the new variety and Bosc, as well as other standard pears.

The optimum, maximum, and minimum P_H values for the growth of the fungus causing 'truffle' disease [*Pseudobalsamia microspora*: ibid., xiv, p. 739] of mushrooms were ascertained to be 6·8, 7·55, and below 3·75, respectively; this range indicates that the organism does not spread in composting manure, though it can remain dormant therein, later being carried into the mushroom houses. It may, perhaps, grow in old manure the P_H value of which is below neutrality.

An early potato seedling of the Cobbler type, 'Nittany Cobbler' was produced [cf. ibid., xiv, p. 222] which is virtually immune from degeneration diseases.

In Lancaster County, Pennsylvania, seed-bed sanitation alone is insufficient to control tobacco wildfire (*Bacterium tabacum*) [loc. cit.]; field sanitation (especially the use of fields that have become clean through crop rotation) and other measures are also necessary. In 1934, Bordeaux mixture, copper-lime dust, and calomel [mercurous chloride] all gave clean seed beds and field plots wherever the field itself was not a source of infection. *Bact. tabacum* survived the winter of 1933–4 under field conditions to an unusual degree, making control measures largely ineffective. The evidence indicates that the surviving bacteria are present not in the soil, but in the woody, incompletely decayed parts of the plant.

Smith (C. O.). **Crown gall on conifers.**— Abs. in *Phytopathology*, xxv, 9, p. 894, 1935.

After referring to records of *Pseudomonas* [*Bacterium*] *tumefaciens* on conifers [*R.A.M.*, xii, pp. 270, 405], the author states that he isolated this bacterium from *Libocedrus decurrens* [ibid., viii, p. 705; xiv, p. 289] in 1916 and successfully reproduced the symptoms of the disease by inoculation on willow (*Salix* sp.) [ibid., xi, pp. 157, 274], cherry [ibid., viii, pp. 16, 630], *Cupressus sempervirens*, and tomato [ibid., xiv, p. 565]. Galls from puncture inoculation with the organism from peach [ibid., x, pp. 40, 249] were produced in 1934–5 on a number of species of *Cupressus*, *Thuja*, *Juniperus*, *Sequoia sempervirens*, *S. gigantea* [ibid., xiv, p. 566], *Pseudotsuga taxifolia*, and *L. decurrens*. With the exception of *S. gigantea* the inoculated conifers did not respond

very actively to the bacterial infection, but the initially small, knob-shaped excrescences gradually expand and may coalesce.

Magrou (J.). **Balais de sorcière et crowngall.** [Witches' brooms and crown gall.]—*Ann. Sci. nat., Bot.*, Sér. X, xvii, 1, pp. 35–36, 2 pl., 1935.

One *Chrysanthemum frutescens* plant out of approximately 100 inoculated with the chrysanthemum strain of *Bacterium tumefaciens* showed a peculiar witches' broom formation on the inoculated branches only. From each of the tumours which developed at the points of inoculation, several small branches with very short internodes arose bearing, in addition to the secondary branches, dense tufts of dwarfed leaves [*R.A.M.*, xiv, p. 635]. Many of the other inoculated *C. frutescens* plants showed secondary tumours on the stems and leaves at some distance from the primary tumour [ibid., xiv, p. 565]; such secondary formations were exceptional on pelargoniums and were not present on tomato or *Ricinus*.

Salgues (R.). **Les tumeurs en pathologie comparée.** [Tumours in comparative pathology.]—*Rev. gén. Sci. pur. appl.*, xlvi, 13, pp. 395–405, 1935.

The writer discusses and illustrates by a large number of concrete examples the nature of the various types of gall induced in man, animals, and plants by animal and vegetable parasites. The analogies and differences between crown gall of plants (*Bacterium tumefaciens*) and human cancer are summarized and considered in the light of contemporary observations [*R.A.M.*, xiii, p. 618]. Tumours in man are also caused by various fungi, e.g., *Rhinosporidium seeberi* [ibid., xiv, p. 631] and *Enantiothamnus braulti* [ibid., xiv, p. 383]. Among the more remarkable instances of neoplasms in plants are mentioned those due to *Ustilago vriesiana* on *Eucalyptus*, *Melanopsichium austro-americanum* on *Polygonum*, and *Cintractia crus-galli* on *Panicum crus-galli*.

Cooper (E. A.) & Preston (J. F.). **Enzyme formation and polysaccharide synthesis by bacteria.**—*Bio-chem. J.*, xxix, 10, pp. 2267–2277, 1935.

The presence of peptone was experimentally shown not to be essential for polysaccharide formation from sucrose by *B.* [*Pseudomonas*] *syringae* [*R.A.M.*, xv, p. 23] and *P.* [*Bacterium*] *pruni* [ibid., xiv, p. 641], the process occurring just as freely with asparagin, and usually with *d*-alanine and *l*-leucine as sole sources of nitrogen. Other bacterial plant pathogens consistently forming polysaccharides of the fructosan type from sucrose are *P. prunicola* [ibid., xiv, p. 319], *P. mors-prunorum* [ibid., xiv, p. 641], *P.* [*Bact.*] *aptatum* [ibid., xi, p. 701], and *P. campestris*. A polysaccharide is occasionally yielded by *P.* [*Bact.*] *phaseoli* [ibid., xiv, p. 565], *P.* [*Bact.*] *solanacearum*, *Bacillus carotovorus*, *Bact. tabacum*, and *Bact. marginale* [ibid., xiv, p. 17]. Both *Bact. tumefaciens* and *B. coli*, when introduced into sucrose-peptone cultures of *Bact. pruni*, *P. syringae*, and *B. megaterium* [ibid., xiii, p. 542 and next abstracts], entirely inhibited polysaccharide formation by the latter organisms, the same result following the presence in the medium

of mannose and arabinose in the cases of *Bact. pruni*, *B. megaterium*, and *B. mesentericus*.

Details are given of the chemical constitution of the polysaccharides synthesized by the plant pathogens and methods for their preparation on a large scale described in connexion with *Bact. pruni* and *P. prunicola*.

Lominski (I.). **Inactivation du bactériophage par oxydation.** [The inactivation of the bacteriophage by oxidation.]—*C.R. Soc. Biol., Paris*, cxix, 24, pp. 952–954, 1935.

Potassium permanganate was found to inactivate two bacteriophages of *Staphylococcus*, two of the colon bacillus [*Bacillus coli*], one of [*B*]. *subtilis*, 889 strain, and that of [*B.*] *megaterium* [preceding abstract], the inactivating concentration being in a direct ratio to the reducing capacity of the medium and in inverse ratio to the temperature. Hence it would appear that the inactivation of the bacteriophage by potassium permanganate is due to oxidation of the active principle [see next abstracts].

Lominski (I.). **Sensibilité comparée des bactériophages et des bactéries homologues à l'oxydation.** [The comparative sensivity of bacteriophages and the homologous bacteria to oxidation.]—*C.R. Soc. Biol., Paris*, cxix, 25, pp. 1090–1092, 1935.

Further experiments in which the bacteriophages of *Staphylococcus*, the colon bacillus [*Bacillus coli*], [*B.*] *subtilis*, and [*B.*] *megaterium* were exposed, together with their homologous organisms, to concentrations of potassium permanganate ranging from 0·1 to 1 per cent. showed the former to be more sensitive than the latter to oxidation [see preceding and next abstracts]. This behaviour is in marked contrast to the resistance of the bacteriophages to most physical and chemical agencies —high pressure, radiation, antiseptics, and the like—and furnishes a means of freeing a bacterial culture from this type of contaminant. Potassium permanganate oxidation seems to act exclusively on extracellular bacteriophages and thus affords a mode of distinguishing spontaneously lysogenous cultures and ordinary ones contaminated by bacteriophage.

Lominski (I.). **Inactivation du bactériophage par oxydation ; réactivation par l'acide ascorbique.** [Inactivation of the bacteriophage by oxidation; reactivation by ascorbic acid.]—*C.R. Soc. Biol., Paris*, cxix, 27, pp. 1345–1348, 1935.

The bacteriophages of *Staphylococcus*, the colon bacillus [*Bacillus coli*], [*B.*] *subtilis*, and [*B.*] *megaterium* were found to be inactivable by iodine (30 to 50 per cent. Lugol's fluid), oxygenated water (24 hours' exposure to 1 to 1·5 per cent. for young cultures, 0.2 to 0·3 per cent. for old ones), and oxygen, the action of which is favoured by a temperature of 37° C. As in the case of potassium permanganate [see preceding abstracts], these processes appear to involve the lytic principle itself and not the medium. Bacteriophages inactivated by iodine or oxygen cannot be revived either by dilution of the inactivants or by passage through cultures of the homologous bacteria, but in certain

cases the addition of ascorbic acid to the medium restored the lytic properties.

DAVIDSON (H. F.). **Some notes on Phytophthora palmivora Butl. on Tecoma smithii.**—*Ceylon J. Sci.* (formerly *Ann. R. bot. Gdns Peradeniya*), xii, 1, pp. 37–44, 2 pl., 1934. [Received December, 1935.]

The author states that isolations from a *Tecoma smithii* plant that had been killed by a collar and root rot yielded a strain of *Phytophthora palmivora*, the pathogenicity of which to this host was proved by inoculation experiments. When paired in culture on maize meal agar with a *P. palmivora* strain from *Hevea* rubber, this strain produced oospores only at the junction of the two growths, and none outside this zone, thus showing that the strain from *T. smithii* belongs to Gadd's cacao group of *P. palmivora* [*R.A.M.*, viii, p. 527]. The thick-walled, yellow or yellowish brown oogonia measured 24 to 34 μ in diameter, and the oospores 18 to 27 (mean 22·4) μ. The fungus produced on the same medium an abundance of sporangia, 39 to 79 (mean 54·7) by 22 to 40 (mean 28·9) μ, the germination of which either by means of germ-tubes or by the formation of zoospores is described in detail; the latter mode was only observed in young sporangia. The discharge of zoospores did not take place at temperatures below 20° C. or above 24°, or in the absence of air in the water, while light did not have any significant bearing on the process.

VANTERPOOL (T. C.). **Studies on browning root rot of cereals. III. Phosphorus-nitrogen relations of infested fields. IV. Effects of fertilizer amendments. V. Preliminary plant analyses.**—*Canad. J. Res.*, xiii, 4, pp. 220–250, 1 pl., 2 figs., 3 graphs, 1935.

In further investigations of the browning root rot of cereals in Saskatchewan [*R.A.M.*, xi, p. 434], the author states that while the trouble has been shown to be due primarily to the parasitism of species of *Pythium*, probably chiefly *P. arrhenomanes* [ibid., xiv, pp. 95, 494], the fact that severely diseased zones shift in location from one year to another clearly indicates a relationship between the disease and environmental conditions, and the paramount importance of these factors in determining its severity. The chemical analysis of 66 pairs of prairie soil samples, from healthy and diseased areas in central and north-central Saskatchewan, showed that in 90 per cent. of the diseased areas the available phosphorus was less than in the healthy fields, and 74 per cent. contained more nitrate nitrogen than the healthy. In 65 per cent. of the diseased areas the soil was poor in phosphorus and rich in nitrate nitrogen; 21 per cent. showed low phosphorus with low nitrate nitrogen; 7·5 per cent. showed high phosphorus with high nitrate content; and only 1·5 per cent. contained high phosphorus with low nitrate nitrogen.

Field observations showed that in diseased areas poor in available phosphorus and rich in nitrate nitrogen the average height of the wheat seedlings in June was 7·8 cm. less than that of the seedlings in the healthy areas, while just before harvest in August, the plants in the diseased areas averaged up to 20 cm. shorter, and matured from 3 to

21 days later than those in the healthy areas. In tests to determine the bearing of cultural practices on the disease, it was shown that summer fallow tends to increase considerably the nitrate nitrogen content, while having no effect on the available phosphorus. The results indicate that where the P/N ratio is relatively wide, the crop is apparently healthy, and conversely where it is narrow the crop is diseased. In places where much available phosphorus was returned to the soil by burning straw and chaff from former stacks, healthy crops developed, and this effect was usually carried over for many years. Greenhouse experiments and field observations showed further that applications of phosphate and also of farm-yard manure at the time of sowing permitted the development of normal wheat plants in diseased areas, and that the application of straw inhibits the disease to some extent, while inorganic nitrogenous fertilizers usually have no effect, and occasionally may prove detrimental. The data also suggested that applications of phosphate to fields with more than 45 parts per million available phosphorus are unlikely to give increases in yield; an increase is probable in fields with 21 to 45 p.p. million, while large increases may be expected in fields with less than 20 p.p. million of available phosphorus.

Preliminary plant analyses indicated that the total phosphorus content is lower in diseased than in healthy wheat plants, and that the former contain relatively more water-soluble nitrogen and relatively less protein nitrogen than the latter. Attention is drawn to the striking similarity of the factors affecting the severity of the browning root rot of wheat with those that influence the *Pythium* root rot of sugar-cane in Hawaii [ibid., xiv, p. 530].

The results of these studies lead the author to consider that an improper balance of the available phosphorus and nitrate nitrogen in the soil brings about an unbalanced metabolism of wheat seedlings at a critical stage in the development, thus predisposing them to fungal attack. The effect of the unbalanced nutrients on the parasitism of the pathogen requires further elucidation.

DAVIES (F. R.). **Superiority of silver nitrate over mercuric chloride for surface sterilization in the isolation of Ophiobolus graminis Sacc.**— *Canad. J. Res.*, xiii, 3, pp. 168–173, 2 figs. 1935.

In studies of the parasitism of cereal foot- and root-rotting fungi in Canada, difficulty has been experienced in isolating the take-all fungus (*Ophiobolus graminis*) [*R.A.M.*, xiv, p. 748] from infected material surface-sterilized with mercuric chloride. A brief, tabulated account is given of experiments, the results of which showed that this is chiefly due to the higher toxicity of this chemical to *O. graminis* than to *Helminthosporium* and *Fusarium* [loc. cit.], both of which develop freely from treated material. The isolation of *O. graminis* was found to be considerably easier when 1 in 100 silver nitrate was used for a period of two minutes, successful isolations ranging from 29·3 to 9·3 per cent., as against 2·8 to 1·3 with mercuric chloride. In comparative tests it was further shown that silver nitrate is less toxic to *O. graminis* than mercuric chloride, the reverse being true for *H. sativum*.

Straib (W.). **Auftreten und Verbreitung biologischer Rassen des Gelbrostes (Puccinia glumarum [Schm.] Erikss. et Henn.) im Jahre 1934.** [The occurrence and distribution of biologic forms of yellow rust (*Puccinia glumarum* [Schm.] Erikss. & Henn.) in the year 1934.]—*Arb. biol. Reichsanst. Land- u. Forstw., Berl.-Dahl.*, xxi, 3, pp. 455–466, 1935.

A tabulated account is given of the writer's studies at the Brunswick branch of the Biological Institute on the prevalence of yellow rust of wheat and barley (*Puccinia glumarum*) in Germany in 1934 [*R.A.M.*, xiv, p. 294]. The material on which the work was based comprised 114 specimens, of which 110 were collected on wheat and 4 on barley from 74 localities, 59 in Germany and 15 abroad. The 169 monospore cultures thus obtained fell into 14 physiologic forms, including three new ones to which the numbers 23, 24, and 25 have been assigned. Form 23, occurring in Holland and Germany and detected in 1935 in Bulgaria, and form 24, restricted to France, were characterized by extreme severity on barley [see next abstracts], while wheat was relatively mildly attacked, the Michigan Amber variety remaining highly resistant to both forms and Chinese 166 immune from 24 but not from 23. This behaviour cannot, however, be considered to justify the retention of Eriksson's formae speciales *tritici* and *hordei* [ibid., xii, p. 272; xiii, p. 757, *et passim*], more especially in view of the existence of forms of equally slight pathogenicity to both crops which cannot be placed in either of these categories. The other new form, 25, was present only on Turkish material and was differentiated from forms 14 and 18 by its virulence to Webster, and from 13 by its inability to attack Chinese 166. The distribution of form 7 was again extended in Germany, probably owing to the widespread cultivation of varieties very susceptible to it, e.g., Carsten V, whereas the other forms mostly occurred only sporadically in the various countries supplying specimens. Form 6 was found for the first time in England (Cambridge) and form 15 in northern Sweden, but in general no striking changes were noted in the distribution of the forms of *P. glumarum* under observation.

Straib (W.). **Ueber Gelbrostanfälligkeit und -resistenz der Gerstenarten.** [On the susceptibility and resistance of Barley varieties to yellow rust.]—*Arb. biol. Reichsanst. Land- u. Forstw., Berl.-Dahl.*, xxi, 3, pp. 467–481, 1935.

A tabulated account is given of the writer's investigations on the reaction of 185 barley varieties (158 summer and 27 winter) to 13 physiologic forms of yellow rust (*Puccinia glumarum*) [see preceding and next abstracts]. The test material was inoculated in the seedling stage in the greenhouse. The most virulent forms were found to be the newly isolated 23 and 24, only Ackermanns Bavaria, Heils Franken, and Heines Hanna of the German varieties being immune from the former and none from the latter, while two strains of *Hordeum vulgare pallidum* completely withstood infection not only by these two forms but by all the others used in the trials.

STRAIB (W.). **Infektionsversuche mit biologischen Rassen des Gelbrostes auf Gräsern.** [Inoculation experiments with biologic forms of yellow rust on grasses.]—*Arb. biol. Reichsanst. Land- u. Forstw., Berl.-Dahl.*, xxi, 3, pp. 483–497, 1935.

The writer discusses and tabulates the results of his inoculation experiments on 227 grasses with three physiologic forms of *Puccinia glumarum* [see preceding abstracts], viz., 24, corresponding to f.sp. *hordei* Erikss., 2, agreeing with f.sp. *tritici* Erikss., and 18, occupying an intermediate position. No justification could be found for the retention of the formae speciales. A number of the grasses susceptible to the above-mentioned three forms, including *Bromus tectorum*, *Elymus europaeus*, *E. arenarius*, *E. sibiricus*, *Festuca* [*Glyceria*] *distans*, *Hordeum jubatum*, *H. murinum*, *Lamarkia aurea*, and *Agropyron repens*, were further tested for their reaction to 17 other forms of the rust, which for the most part attacked all indiscriminately.

WINKELMANN (A.). **Warum tritt der Weizensteinbrand trotz Beizung stärker auf?** [Why is Wheat bunt more prevalent in spite of treatment?]—*Pflanzenbau*, xii, 4, pp. 149–156, 1935.

In this paper the writer discusses the reasons for the increasing prevalence of wheat bunt (*Tilletia tritici*) [*T. caries*] in Germany and elsewhere of recent years notwithstanding the general improvement both in the extent and technique of seed-grain disinfection. Various explanations of this phenomenon have been advanced. It was thought, for instance, that the extended cultivation of wheat might afford increased opportunities of soil infection, but experiments showed that, while this source of inoculum cannot be entirely disregarded, it is seldom of primary importance under German conditions. The dusting and short disinfection processes, however, were not found to confer adequate protection on the seed-grain against this form of attack. No grounds could be found, moreover, for the supposition that any appreciable amount of infection takes place between the treating and sowing of the seed-grain. Experiments are now in progress to determine whether the development of more highly pathogenic physiologic forms is responsible for the increasing virulence of the disease [*R.A.M.*, x, p. 715; cf. also ibid., xiii, p. 293].

BODNÁR (J.), TERÉNYI (A.), & PÁSKUJ (J.). **Wirkungsmechanismus von Arsenverbindungen auf die Weizensteinbrandsporen.** [The mechanism of the action of arsenic compounds on Wheat bunt spores.]—*Biochem. Z.*, cclxxix, 5–6, pp. 448–452, 1935.

A tabulated account is given of the writers' studies in Hungary on the mode of action of some arsenic compounds on wheat bunt (*Tilletia tritici*) [*T. caries*] spores [cf. *R.A.M.*, xiii, p. 431].

Appreciable quantities of arsenic were found to be adsorbed by the spores from arsenic acid (0·97 per cent. from a 1 per cent. solution after 24 hours) and salvarsan (1·11 per cent. from a 0·32 per cent. solution), but not from arsenates, arsenites, or organic arsenic compounds; after washing the amounts left were 0·19 and 1·10 per cent., respectively, showing that the arsenic adsorption from arsenic acid

was reversible but not that from salvarsan. A definite correlation was established between adsorption and the physiological effects of the treatment, only the arsenic-containing spores failing to germinate in a calcium nitrate solution. The adsorbed arsenic remaining in the spores after washing becomes united with the enveloping albuminous substances liberated in the disinfectant solution. On moist soil, however, the arsenic is dissolved and the spores treated with arsenic acid or salvarsan germinate well, so that the action of the adsorbed arsenic is merely inhibitory. Omitting the post-immersion washing, arsenious acid, potassium arsenite, and sodium arsenite killed the bunt spores, whereas the arsenates failed to do so, indicating that arsenites are able to penetrate the interior of the spores during desiccation.

FRON (G.). **Observations au cours de la campagne 1935, sur le développement de la maladie du piétin du Blé.** [Observations during the season of 1935 on the development of foot rot of Wheat.]—*C.R. Acad. Agric. Fr.*, xxi, 23, pp. 922–923, 1 graph, 1935.

The exceptionally heavy rainfall in the Paris region from November, 1934 to April, 1935, followed by a dry spell at the time of earing, resulted in severe infection of the wheat crops by *Cercosporella herpotrichoides* [*R.A.M.*, xiv, p. 502], the primary and secondary attacks of which were clearly distinguishable. Encouraging results in the control of the disease were given by seed-grain disinfection with quinolin in dust or liquid form.

BRANDENBURG (E.). **Ontginningsziekte en kopergebrek.** [Reclamation disease and copper deficiency.]—*Meded. Inst. Suikerbiet., Bergen-o.-Z.*, 9, pp. 245–256, 2 figs., 1935. [French summary.]

After briefly reviewing previous investigations by himself and others on the reclamation disease of oats and other crops [*R.A.M.*, xv, p. 86], the writer describes a series of carefully controlled culture experiments with Victory oats in the Zinzadze II nutrient solution plus boric acid, manganese and zinc sulphate, and potassium sulphate, with and without the addition of copper sulphate, in concentrations of 0·05 to 0·5 mg. per l. Copper was found to be indispensable to the healthy growth of the plants, which developed the symptoms of reclamation disease in its absence and did not form normal panicles and grain unless supplied with reasonably large quantities (0·5 mg. per l.).

There is no connexion between reclamation disease and the *Pythium* infection of beets [ibid., xiv, p. 548], broad beans [*Vicia faba*], and peas, which cannot be combated by the application of copper to the soil.

WICKENS (G. M.). **The objects and value of seed treatment of Maize against Diplodia.**—*Rhod. agric. J.*, xxxii, 10, pp. 721–724, 1935.

In a field test carried out in Rhodesia in 1935, maize seed, containing a large proportion of grain infected with *Diplodia* [*D. zeae* and *Gibberella saubinetii*: *R.A.M.*, xi, p. 39; xii, p. 775; xv, p. 118] and sown one week after being dusted with four [unspecified] proprietary fungicides yielded, respectively, 243·5, 227·75, 242, and 228·75 lb. per $\frac{1}{10}$ acre, as compared with 220·5 lb. in the untreated controls. Contrary to general

experience the treatments retarded and reduced germination of the seed, possibly because the latter was of very poor quality. The practice of burning trash has been found appreciably to lessen cob infection.

Van der Plank (J. E.). **Some aspects of the error of estimates of wastage in stored fruit.**—*J. Pomol.*, xiii, 3, pp. 223–231, 1 graph, 1935.

The author states that in experiments concerning wastage in fruit stored for periods comparable with those encountered in commercial practice, the standard error of the estimate of wastage tends to be high, and that, in consequence, comparisons of samples are usually trustworthy only when large amounts of fruit are used, which is both expensive and tedious. An investigation [some details of which are given] was therefore made of the factors influencing the magnitude of the standard error, the results of which indicated that since the distribution of wastage among replicates is, in statistical terminology, discontinuous (the minimum difference between boxes being one wasty fruit), the percentage standard error (coefficient of variability) is greatly influenced by the amount of wastage developed in a sample. When only a small amount of wastage has developed, the percentage standard error always tends to be high, and the comparison of the wastage in different samples is difficult; as wastage increases, however, the percentage standard error decreases, at first rapidly but later more slowly, until finally it approaches a minimum, and further increases in wastage have scarcely any effect.

From the practical standpoint, in experiments in which only a small amount of wastage is expected, measures designed to increase wastage may considerably increase the efficiency of the test, while the use of more uniform fruit, its handling under more uniform conditions, and other measures devised to render the samples less heterogeneous are not effective in reducing the standard error. The latter measures should only be used in experiments in which a large amount of wastage is expected.

These conclusions have been based on the simplifying assumption that the coefficient of variability is a measure of experimental efficiency, an assumption which is not legitimate when wastage is very high (above 30 per cent.).

Smith (R. H.) & Parker (E. R.). **Use of zinc with oil sprays.**—*Calif. Citrogr.*, xx, 12, p. 374, 1935.

Experiments in California indicated that the zinc materials used against citrus mottle leaf [*R.A.M.*, xiv, p. 753] react with oil sprays, impairing their wetting or spreading quality and in most cases giving them a heavier oil deposit than normal. This disadvantage can be obviated, however, by using more spreader or a supplementary spreader such as blood albumin. When the mottle is not exceptionally severe, a good quality zinc oxide (which appears to be more compatible with oil sprays than most zinc materials) should be used at the rate of 1 lb. per 100 galls. of spray, or at half this concentration in mild cases, with blood albumin added at the rate of 6 oz. per 100 galls.

CONROTTE (L.). **Technique générale d'une plantation de Palmiers Elaeis au Congo Belge.** [A general technique for an Oil Palm plantation in the Belgian Congo.]—*Bull. agric. Congo belge*, xxvi, 1, pp. 46–88, 8 figs., 1935.

In these full, practical notes on the culture of the oil palm (*Elaeis*) [*guineënsis*] in the Belgian Congo brief reference is made to the symptoms and control of various diseases of this host. These include bud rot; crown disease [*R.A.M.*, xiv, p. 357]; unspecified fungal fruit diseases; an obscure condition in which the fruits dry up while still attached to the tree; a disease, apparently of bacterial origin, in which though the trees remain apparently healthy the fruits become sticky; and rotting at the base of the trunk of old palms occasioned by various unspecified fungi [? *Ganoderma applanatum*: ibid., xii, p. 80], causing the death and falling of the affected trees.

BITANCOURT (A.). **A Hemileia e o Brasil.** [*Hemileia* and Brazil.]—*Rev. Inst. Café Estac. S. Paulo*, x, 105, pp. 2106–2109, 1 fig., 1935.

An outline is given of the history and distribution of the coffee leaf rust (*Hemileia vastatrix*), the absence of which from Brazil is regarded as a contributory cause of its relatively immense production (averaging 12,789,000 sacks per annum during 1911–25), as compared with other coffee-growing countries (4,367,000 sacks), from the eighties of the last century onwards.

STEYAERT (R. L.). **Étude du shedding en rapport avec la 'frisolée' du Cotonnier.** [A study of shedding in relation to 'frisolée' of Cotton.]—*Bull. agric. Congo belge*, xxvi, 1, pp. 3–45, 12 figs., 24 graphs, 1935.

A full account is given of the author's detailed study of the shedding of cotton floral buds and bolls in the Belgian Congo in relation to physiological and meteorological factors and the disorder termed 'frisolée'. The results obtained [which are tabulated] showed that the intensity of the shedding is correlated with the stage of growth reached by the organs concerned, and that the dropping of the floral buds is directly affected by drought, that of the bolls being due to the indirect action of soil moisture on the osmotic strength of the cell sap.

'Frisolée' becomes most intense when shedding reaches a maximum. The first symptoms appear when boll formation begins and take the form of a late season tomosis [*R.A.M.*, iv, p. 167], the leaves as soon as they open showing perforations in the blade or even lacerations completely separating the veins. If the whole leaf surface is affected the leaf has a flattened appearance, but if only part is attacked the resulting growth inequalities produce malformations and distortions. The internodes of the boll-bearing branches are shortened and axillary buds are formed. The top parts of the plants either produce no bolls or misshapen ones. Plants in a strongly vegetative phase are the most susceptible. Control would appear to consist in the selection of resistant lines.

VASUDEVA (R. S.). **Studies on the root-rot disease of Cotton in the Punjab.**—*Indian J. agric. Sci.*, v, 4, pp. 496–512, 2 pl., 2 graphs, 1935.

Root rot of American and indigenous cotton is stated to be of long standing in the Punjab, where the annual losses caused by it vary considerably from region to region (from about 1·15 per cent. in the Sargodha Colony up to 60 per cent. in the zamindars' area), and are conservatively estimated to average approximately 2·5 per cent. of the crop for the whole State, entailing a loss of Rs 1,575,000 [£118,125] per annum. The most striking symptom of the disease is the sudden and complete wilting of affected plants, recovery being very rare and only occurring in cool nights, in wet weather, or in irrigated fields; the whole of the root system, with the exception of the tap and a few lateral roots, becomes decayed and detached, so that the plants may be easily pulled out of the ground. These features, as well as the facts that in recently wilted plants the root is slightly moist and sticky to the touch at the tip and shows considerable shredding of the bark and yellowing of the exposed woody tissues, distinguish this rot from the cotton root rot in the Gujerat [*R.A.M.*, xiv, p. 359], with which, however, it has many points of similarity. In badly affected plants the wood may become brown or black and all the root tissues broken down into shreds. Sclerotia have been observed only rarely. The disease first appears in June, when the cotton plants are about six weeks old, reaches a maximum percentage incidence within a fortnight, and continues so throughout July; in August the mortality rate gradually declines, and falls almost to zero by the end of September.

Isolations from diseased root material yielded two species of *Rhizoctonia*, one of which was identified as a strain of the *R.* [*Corticium*] *solani* group [ibid., x, p. 661; xiv, p. 629], and the other is provisionally considered to be a strain or saltant of *R. bataticola* [*Macrophomina phaseoli*: ibid., x, p. 660; xiv, p. 359], two strains of *Fusarium solani*, either alone or associated with *Rhizoctonia* and occasionally *Alternaria* sp. and *Helminthosporium* sp.

Preliminary pot infection experiments, in which the inoculum was placed in contact with the roots, gave no definite signs of root rot except that some of the roots were affected by either of the species of *Rhizoctonia*. In a second series the soil was washed from the roots of plants six to ten weeks old and the plants repotted in sterile soil. After seven to ten days the top layer of soil was removed, the inoculum added, and the top soil replaced. Within five to seven days, 7 out of 10 plants showed infection by *C. solani*, 2 out of 8 by *M. phaseoli* [loc. cit. and cf. ibid., xiv, p. 233], and 0 out of 17 by the two strains of *F. solani*. In a third series the washed plants were repotted in infected soil, the corresponding results being 9 out of 9, 5 out of 8, and 0 out of 12. Further experiments in which the soil was washed away to a depth of 4 in., the inoculum and then sterile soil being added, gave infection by *C. solani* varying from 8·3 to 78·6 per cent. and by *M. phaseoli* of 15 to 100 per cent. Other experiments [which are described in detail], both by planting seed in pots containing sterilized infected soil and in the field by washing away the soil from the roots with a hose before

adding the inoculum, gave positive results, *C. solani* infecting 50 out of 108 plants inoculated in the field, and *M. phaseoli* 24 out of 145. On the basis of these results the author attributes the disease to these two fungi.

ARNDT (C. H.). **The etiology of damping off of Cotton seedlings.**—Abs. in *Phytopathology*, xxv, 10, pp. 968–969, 1935.

Glomerella gossypii [*R.A.M.*, xiv, p. 629] was responsible for heavy losses among cotton seedlings in 1934 in South Carolina, where greenhouse studies showed that it may cause damping-off at soil temperatures up to 30° C. *Fusarium* spp., though representing 15 to 75 per cent. of the organisms isolated from diseased hypocotyls, do not appear to be the cause of appreciable losses in the stands, and the same is true of *Rhizoctonia* [*Corticium solani*: see preceding abstract] which was found on less than 10 per cent. of the infected material examined during the last ten years. In one field *Pythium ultimum* [ibid., xiv, p. 383] was observed to be a common agent of reduced germination and impoverished stand.

YOUNG (V. H.), WARE (J. O.), & POPE (O. A.). **Control of potash hunger and Fusarium wilt in Cotton.**—Abs. in *Phytopathology*, xxv, 10, p. 969, 1935.

Of the 18 cotton varieties resistant to wilt (*Fusarium*) [*vasinfectum*] tested in 1934 in western Arkansas, five, viz., Clevewilt 33–6, Dixie 14, Rhyne's Clevewilt 33–10, Coker's Clevewilt 3, and Rhyne's Clevewilt, showed 4 to 8 per cent. infection compared with 29 to 44 per cent. for the five most susceptible, namely, Startex, Acala 1114, Super Cleveland, Trice, 304, and Half and Half [*R.A.M.*, xiii, p. 698; xiv, pp. 221, 629, and next abstract]. Among the 36 varieties studied in the eastern part of the State, the incidence of infection ranged from 1 per cent. in Rhyne's Clevewilt to 49 per cent. in Half and Half, the susceptible varieties consistently falling into the low-yielding group.

The results of five years' experiments indicate that the control of potash hunger or 'rust' [ibid., xiv, p. 629] by the application of potash-containing fertilizers leads to a marked decrease, in central and eastern Arkansas, in the severity of wilt attacks. In 1933 and 1934 the use of a resistant variety, Rowden 2088, combined with potash applications, gave the best control of 'rust' and wilt.

NEAL (D. C.). **Wilt-resistant Cottons adapted to the Gulf Coastal Plains.**—Abs. in *Phytopathology*, xxv, 10, p. 974, 1935.

Of the cotton varieties resistant to wilt [*Fusarium vasinfectum*: cf. preceding abstract] those best adapted to cultivation in the southern part of Mississippi were found in trials from 1932 to 1934 to be selections of Dixie Triumph, Miller, and D. & P. L., which have given yields exceeding one bale per acre under conditions of severe infestation. The fibre of several of the selections is also of superior quality and correct length. Selections of Acala, Cook, Toole, Nucala, Clevewilt, Super Seven, Lightning Express, and Mexican Big Boll showed some degree of resistance to wilt in these tests but are less suitable for local conditions than the foregoing.

MILES (L. E.). **The Verticillium wilt disease of Cotton.**—Abs. in *Phytopathology*, xxv, 10, pp. 972–973, 1935.

Cotton wilt (*Verticillium*) [*albo-atrum*: *R.A.M.*, xiii, p. 632], first reported from Mississippi in 1930, has been found in nine counties of the State and in Tennessee, Arkansas, California, Oklahoma, and Virginia, as well as in Greece. In July, 1933, field inoculations were made with strains of the fungus from (1) cotton in Mississippi, (2) cotton in California, and (3) Irish potatoes in Canada. The Mississippi strain produced severe infection of all the plants in a fortnight, that from California caused relatively mild symptoms on 16 per cent., while the Canadian strain gave negative results. The mottling and blotching characteristic of the Mississippi strain did not develop in plants infected by the Californian form. Neither strain proved pathogenic during hot, dry weather in August. On potted greenhouse tomatoes inoculated with the same strains in the spring of 1933, the Canadian caused much more severe and earlier symptoms than either of the others, but the latter were much more virulent than the Canadian form on eggplants, snapdragons [*Antirrhinum majus*], beets, and California poppy [*Eschscholtzia californica*]. The Californian strain differs from the others in producing no microsclerotia in culture.

STEYAERT (R. L.). **Un ennemi naturel du Stephanoderes, le Beauveria bassiana (Bals.) Vuill. Étude des facteurs ambiants régissant sa pullulation.** [A natural enemy of *Stephanoderes*, *Beauveria bassiana* (Bals.) Vuill. Study of the environmental conditions which govern its spread.]—*Publ. Inst. nat. Étude agron. Congo Belge* 2 (*Sér. sci.*), Brussels, 46 pp., 2 figs., 14 graphs., 1935.

A tabulated account is given of field and laboratory experiments to determine the environmental conditions which favour the epidemic spread of *Beauveria bassiana* on the coffee berry borer (*Stephanoderes hampei*) [*R.A.M.*, xiv, pp. 224, 629] in coffee plantations in the Belgian Congo. Field observations indicated that the greater percentage mortality among insects living on green berries is due to their longer exposure to infection with the fungus while seeking a berry of sufficient maturity in which to lay their eggs, as once ensconced inside the berry the insects are relatively well protected from infection. Dull weather also favours the spread of the disease, as the insects shun direct sunlight and come out of the galleries only in the evening or during cloudy, sunless periods. The optimum humidity for infection appeared to be around 79 per cent. A brief discussion is given of the bearing of these findings on the possibility of using *B. bassiana* for the biological control of the coffee berry borer.

DURANT (A. J.) & TUCKER (C. M.). **Aspergillosis of wild Turkeys reared in captivity.**—*J. Amer. vet. med. Ass.*, lxxxvi, 6, pp. 781–784, 2 figs., 1 graph, 1935.

Aspergillus fumigatus was determined as the agent of a serious disease involving the majority of 785 wild turkey poults reared in captivity in Missouri in 1934 [cf. *R.A.M.*, xiii, p. 510; xv, p. 19], the fungus being isolated from congested lung tissue and grown on acidified

potato-dextrose agar. Samples of the commercial mash feed of cod-liver oil and fish meal proved to be heavily infested, and the evidence obtained by feeding experiments with infected and sterilized material definitely implicated the former as the source of the trouble.

SZATHMÁRY (S.). **Unbekannte Varietät des Kaufmann-Wolfschen Epidermophyton.** [An unknown variety of the Kaufmann-Wolf *Epidermophyton.*]—*Derm. Wschr.*, ci, 43, pp. 1327–1329, 4 figs., 1935.

Both in the site of infection on the back of the hand and in the furcate colonies on maltose-peptone agar a strain of *Epidermophyton* isolated from a 20-year-old carpenter's apprentice in Hungary differed from the normal type of *E.* Kaufmann-Wolf [*R.A.M.*, xiv, pp. 104, 759]. However, the typical cerebriform aspects of the subcultures, the results of animal inoculations, and the morphological characters of the fungus are considered to identify it as a hitherto unknown variant of the species in question.

DEY (N. C.) & MAPLESTONE (P. A.). **Ringworm of the scalp in India.**—*Indian med. Gaz.*, lxx, 10, pp. 541–544, 1 col. pl., 4 figs., 1935.

Of 53 consecutive cases of tinea of the scalp examined during the last three years at the Calcutta School of Tropical Medicine, 20 were found to be due to *Trichophyton violaceum* [*R.A.M.*, xiii, p. 511; xiv, pp. 35, 102], here recorded for the first time in India, while the rest, with the exception of two cases of favus, were caused by *Microsporon audouini* [ibid., xiv, p. 695].

Spores of the former fungus, 3 to 5 μ in diameter, were distributed axially along the infected hairs, to which a characteristic beaded appearance is imparted, quite distinct from the mosaic aspect of material attacked by the small-spored *M. audouini.* The fungus was cultured from infected hair, epidermal scales, and pus from follicles on the scalp, the best growth occurring on Sabouraud's maltose-peptone agar and Pollacci's medium. With each subculture the typical violet coloration gradually fades until the colonies appear either uniformly or patchily cream-coloured; occasionally the primary cultures themselves are cream-coloured. On a synthetic nutrient medium the normal violet colour of the colonies was replaced by pink. Modifications in the type of growth of *T. violaceum* were also observed in the course of subculturing. The long, slender mycelium contained spore-like structures, while in well-slide preparations both terminal and intercalary chlamydospores are found, the former being oval or round, 16 to 18 μ in diameter, and old mycelia develop irregular arthrospores with unilateral swellings. Positive results were given by inoculations on two monkeys.

Considered both from the cultural and morphological standpoints, *T. violaceum* should preferably be transferred to *Achorion*, to which it approximates in its faviform type of growth (reproduced in the lesions on the monkey) and in the formation of chlamydospores and arthrospores, and it is therefore proposed to rename it *A. violaceum*, the following being synonyms: *T. album* Sabouraud [ibid., xiii, p. 513], *Ectotrichophyton album* Castellani & Chalmers, *T. glabrum* Sabouraud

[ibid., x, p. 458], *T.* (*indicum*) *violaceum* Acton & McGuire, and *T.* (*decalvans*) *violaceum* Castellani.

CROSTI (A.). **Osservazioni e ricerche sui rapporti biologici e patogeni che intercorrono tra Trichophyton violaceum e glabrum.** [Observations and researches on the biological and pathogenic relationships existing between *Trichophyton violaceum* and *T. glabrum.*]—*Boll. Sez. reg.* (*Suppl. G. ital. Derm. Sif.*), xiv, 4, p. 351, 1935.

In Umbria, where *Trichophyton violaceum* is stated to be endemic and responsible for 85 per cent. of the cases of scalp ringworm, *T. glabrum* has been isolated six times during the last four years [*R.A.M.*, xiv, p. 35 and preceding abstract]. The two fungi cause exactly the same clinical manifestations. *T. glabrum* develops more rapidly than *T. violaceum* and forms well-defined radial colonies in culture. Pleomorphism in the accepted sense was found to be quite exceptional in both organisms, *T. glabrum* normally being entirely without chromogenic properties on any of the usual substrata, though three strains assumed a temporary purple coloration in Sabouraud's medium with salts of magnesium, which also accentuated the pigmentation in *T. violaceum*, but this was lost in liquid media or Sabouraud's at 37° C. The purple pigment is readily extractable with benzol. Neither fungus exercises any appreciable pathogenic effect on animals.

SAUTHOF (G.). **Über Zusätze zu Nährboden, die das Wachstum der Pilze nicht stören, das von Bakterien aber hemmen.** [On admixtures with nutrient media which inhibit bacterial growth without impeding that of fungi.]—*Derm. Wschr.*, ci, 40, pp. 1245–1247, 1935.

The admixture of 10 per cent. of a 1·5 per cent. yatren solution with Sabouraud's or Grütz's nutrient agar was found to inhibit bacterial contamination without impeding the development of *Trichophyton gypseum* [*R.A.M.*, xiv, p. 510].

DAVIDSON (A. M.) & GREGORY (P. H.). **The so-called mosaic fungus as an intercellular deposit of cholesterol crystals.**—*J. Amer. med. Ass.*, cv, 16, pp. 1262–1264, 4 figs., 1935.

The irregular, discrete, branching threads of the so-called 'mosaic fungus', a frequent concomitant of ringworm agents [*Trichophyton* spp.] in scrapings from the feet, was found in the course of four years' routine laboratory work at Winnipeg, Canada, to consist mainly, if not entirely, of crystals of cholesterol, soluble in xylene and other fat solvents. It is therefore proposed to refer to the disease as the 'cholesterol mosaic' pending further studies on its nature.

NEGRONI (P.). **Variation du type R. de Mycotorula albicans.** [Variation of the R type in *Mycotorula albicans.*]—*C.R. Soc. Biol., Paris*, cxx, 36, p. 815, 1935.

In the course of subculturing a monospore culture of *Mycotorula* [*Candida*] *albicans* [*R.A.M.*, xv, p. 20] in unfavourable media (rabbit serum anti-*C. albicans*, bouillon with glucose and phenol or formol at 0·5 to 1 and 2 per cent., and an alkaline bouillon, with P_H 8 to 9, at

40° C.), the writer observed the development of aberrant colonies approximating to the R [rough] type in bacterial cultures. They were characterized by dentate margins and radial furrows and were only half the size of the S [smooth] colonies, besides being devoid of pathogenic action on rabbits. Unlike the normal smooth cultures, moreover, the rough ones form no hyphae in potato water, and suspensions in physiologic water agglutinate spontaneously with a 2 per cent. solution of trypaflavin and curdle into fine flakes with specific serum. The biologic properties of the rough cultures are identical with those of the smooth but less pronounced, and the cells of both types are capsulate.

Bernhardt (R.), Zalewski (G.), & Burawski (J.). **Generalisierte Torulose (europäische Blastomykose).** [Generalized torulosis (European blastomycosis).]—*Arch. Derm. Syph., Berl.*, clxxiii, 1, pp. 78–90, 5 figs., 1935.

A full account is given of a case of generalized torulosis or European blastomycosis in a 55-year-old agricultural worker at a Warsaw hospital. The case, to which some importance is attached in view of the rarity of the disease in Poland, is discussed chiefly under its clinical aspects. The causal organism was found to be a *Torula* [? *Cryptococcus* or *Torulopsis*: see next abstract] closely allied to Urbach's and Zach's strains I b and III b, positive results with which were given by inoculation experiments on laboratory animals, the cultures undergoing no loss of viability in the course of a year.

Benham (Rhoda W.). **Cryptococci—their identification by morphology and by serology.**—*J. infect. Dis.*, lvii, 3, pp. 255–274, 13 figs., 1935.

The identification of species of *Cryptococcus* [*R.A.M.*, xv, p. 96] necessitates observations not only on their morphology and cultural aspects but also on their serological and biological reactions, while virulent strains can be recognized only by animal inoculations. The species parasitic on man may be divided into four groups on the basis of colony characters and agglutination relationships, viz., (1) comprising at least three apparently non-pathogenic species, *C. glabratus*, *C. ovoideus*, and *C. aggregatus*; (2) probably composed of the single species herein described for the first time as *C. mucorugosus*, with corrugated, pitted colonies and three types of cells measuring, respectively, 6 to 7, 5 to 6, and 4 to 5 by 2·5 to 3 μ, forming acid in dextrose, levulose, and maltose, not obviously pathogenic; (3) *C. hominis* [or *Torulopsis neoformans*: loc. cit.], comprising both highly virulent and non-pathogenic strains and two varieties and including within its range *Torula histolytica* and *Saccharomyces tumefaciens*; and (4) embracing a number of pink- or red-pigmented, non-pathogenic strains, bearing a close resemblance to *T. pulcherrima* [ibid., xiv, p. 523] isolated from fruit, especially grapes, for which the name of *C. pulcherrimus* is proposed.

Mazzanti (C.). **Blastomicosi cutanea. (Osservazioni cliniche istologiche e parassitologiche.)** [Cutaneous blastomycosis. Clinical, histological, and parasitological observations.]—*Boll. Sez. reg.* (*Suppl. G. ital. Derm. Sif.*), xiv, 4, pp. 351–352, 1935.

A fungus isolated from granulomatous inguinal lesions in a 34-year-

old male patient at Florence was characterized by minute, circular or clavate, double-contoured elements, reacting positively to nuclear stains, and was identified by Profs. Pollacci and Redaelli as *Gilchristia dermatitidis* [*R.A.M.*, xiv, p. 582].

Farneti (F.). **Ricerche sperimentali sulla azione patogena dell' Aspergillus niger.** [Experimental studies on the pathogenic action of *Aspergillus niger*.]—*Pathologica*, xxvii, 528, pp. 670–679, 1935. [German and English summaries.]

A detailed account is given of the writer's inoculation experiments on rabbits with suspensions of *Aspergillus niger* [*R.A.M.*, xv, p. 20] in doses of 2 to 4 c.c., from which it appears that intraperitoneal injections at the maximum rate consistently induce fatal general intoxication without acute or chronic inflammation in the peritoneal cavity. At lower concentrations the fungus produced no specific pathogenic effects when inoculated either through intraperitoneal, intravenous, or intraparenchymatous channels.

Dudley (H. W.). **Ergometrine.**—*Proc. roy. Soc.*, Ser. B, cxviii, 810, pp. 478–484, 1 pl., 1935.

A precise chemical description is given of the alkaloid ergometrine ($C_{19}H_{23}O_2N_3$) isolated from ergot [*Claviceps purpurea*] with which ergobasine and, in all probability, ergotocin are stated to be identical [*R.A.M.*, xv, p. 22].

[Evidence for the identity of ergotocin with ergometrine is also given by the writer in *J. Amer. chem. Soc.*, lvii, 10, pp. 2009–2110, 1935.]

Mattick (A. T. R.), Hiscox (E. R.), & Davis (J. G.). **Biennial reviews of the progress of dairy science: Section B. Bacteriology and mycology applied to dairying.**—*J. Dairy Res.*, vi, 3, pp. 422–453, 1935.

In this survey of the more important contemporary literature on various aspects of dairy science most of the references of mycological interest are comprised in the section dealing with butter [cf. *R.A.M.*, xiv, p. 761]. The following items, in addition to those already noticed in this *Review*, may be mentioned. Orla-Jensen and Otte (*Maelkeritidende* [Odense, Denmark], 21, p. 411, 1933) advocate storage temperatures not exceeding —3·5° to —7·5° C. for the control of fungal spoilage in butter. The chief sources of mould inoculum are wooden utensils, such as churns and tubs. Not only does the open structure of the wood afford protection to the spores, but according to data obtained by Mme Shunina in 1930 at the Vologda Dairy Institute, U.S.S.R. (*Biol. Abstr.*, viii, p. 164, 1934), the substance itself exerts a stimulatory action on mould growth. Arup and Gilmour (*J. Dep. Agric. Irish Free St.*, xxxii, p. 257, 1933) found little correlation between keeping quality as indicated by flavour scores and the yeast, mould, and bacterial counts of butter. The incidence of moulds was reduced at —12°.

Costa (A. S.) & Krug (H. P.). **Eine durch Ceratostomella hervorgerufene Welkekrankheit der Crotalaria juncea in Brasilien.** [A wilt disease of *Crotalaria juncea* in Brazil caused by *Ceratostomella*.]—*Phytopath. Z.*, viii, 5, pp. 507–513, 8 figs., 1935.

A hitherto undescribed wilt disease of *Crotalaria juncea* in Brazil is characterized by dark, elongated or oval, isolated or confluent lesions proceeding from the stem base upwards and sometimes forming fairly broad stripes, which are reproduced in the xylem and medullary parenchyma. The upper part of the stem becomes limp and commences to droop, while at the same time the lower leaves are shed and the upper ones shrivel. The fungus isolated from diseased material produced both in nature and in culture perithecia with a diameter of 112 to 240 μ, the neck measuring 224 to 832 μ in length and 80 to 128 μ in diameter at the base, ascospores (found only in the medulla of the plants) 3·5 to 5·6 by 3·2 to 4·8 μ, and two types of conidia, namely, hyaline (35 to 108 by 4 to 8 μ) and brown (11·5 to 16 by 9 to 12 μ). These dimensions agree approximately with those of *Ceratostomella fimbriata* [*R.A.M.*, xiv, p. 274], to which the fungus is tentatively referred. Inoculation experiments by means of soil infestation, insertion of culture material through cuts in the stem base, and spraying a spore suspension of the fungus on the plants gave positive results. The organism probably lives in the soil and infects the plants chiefly through the roots. In young plants (20 days old) the incubation period was found to be only four days, increasing to 15 to 20 in older ones (four months). The conidia and ascospores serving as inoculum for secondary infections are produced on the black stripes near soil level. The large numbers of brown conidia in the dying plants probably act as important sources of infection either in the plant refuse or in the soil.

Jenkins (Anna E.) & Wehmeyer (L.). **Transfer of Diaporthe umbrina to the genus Cryptosporella.**—*Phytopathology*, xxv, 9, pp. 886–889, 1 fig., 1935.

When the agent of brown canker of rose was designated *Diaporthe umbrina* [*R.A.M.*, xiv, p. 498] in 1918 (*J. agric. Res.*, xv, p. 593), there was reason to anticipate the development of its pseudoseptate into septate ascospores. This expectation, however, was not realized, and hence it has been decided to transfer the fungus to *Cryptosporella*, a genus established by Shear (*Phytopathology*, i, p. 116, 1911) for an allied fungus, *C. viticola* [*R.A.M.*, xi, p. 790], with unicellular ascospores and a *Phomopsis* conidial stage, as *C. umbrina* (Jenkins) n.comb. [ibid., xiii, p. 270]. A comparison of a hitherto undetermined *Diaporthe* occurring on rose petals in Louisiana with *C. umbrina* revealed a very close relationship between the two species, the chief difference being, apart from the septation of the ascospores, the production by the former of both α and β (*Phomopsis*) conidia, the α conidia being practically indistinguishable from those of the *Cryptosporella*, β conidia not being formed by this species; on maize meal agar the perfect stage developed and the organism is now recognized as *D. eres* [loc. cit.]. Several other collections of *Phomopsis* from rose cankers showed α and β conidia but no perfect stage and are probably referable to *D. eres*.

McWhorter (F. P.). **The properties and interpretation of Tulip-breaking viruses.**—Abs. in *Phytopathology*, xxv, 9, p. 898, 1935.

The theory that tulip breaking [*R.A.M.*, xiii, p. 446] results from the interaction of two antithetic viruses, one tending to add colour to the flowers and the other to remove it, has been substantiated by synthesis of normal breaks by the inoculation of unbroken tulips with virus mixtures. The colour-removing virus was found to be dominant. A juice inoculum of 10 parts of colour virus added to 1 part of colour-removing virus resulted in the synthesis in a group of test plants of numerous normal breaks comparable to commercial Rembrandts in appearance. The two viruses were inseparable on the basis of physical properties, which include thermal death point between 65° and 70° C., virulence in dilutions up to 1 in 100,000, resistance to desiccation of the leaves for 11 days, resistance to alcohol, and ready transmissibility by hypodermic injections. The tulip viruses are stated to be very closely allied to those often found in bulb-perpetuated lilies.

Tompkins (C. M.), Tucker (C. M.), & Clarke (A. E.). **Root rot of Aster caused by Phytophthora cryptogea.**—Abs. in *Phytopathology*, xxv, 9, p. 895, 1935.

A root disease of China asters (*Callistephus chinensis*), caused by *Phytophthora cryptogea* [*R.A.M.*, xiii, p. 516; cf. also xiv, p. 559], was observed at San Francisco and elsewhere in California in 1934. Infection is favoured by low-lying situations and poor drainage. The fungus enters the plants near the base of the tap-root and ascends to the base of the petioles, producing a blackish-brown discoloration of the tissues; owing to the entire loss of turgidity in the leaves the aerial parts collapse and premature death ensues. Inoculation and reisolation tests on young, healthy plants (Late Branching Mary Semple) in the greenhouse at 18° C. with pure cultures of the fungus gave positive results. In further tests complete susceptibility to *P. cryptogea* was shown by 45 varieties, including types resistant to *Fusarium* wilt [ibid., xv, p. 98]. On oatmeal agar a white, cottony mycelium is produced, with occasional clusters of small, hyaline, thin-walled vesicles, but no sporangia or oogonia. On Petri's solution or a non-sterile soil suspension, however, the hyphae develop long-ovate to obpiriform, non-papillate sporangia, 33 by 17·5 μ, with a small, refringent, thickened region at the apex, but no oogonia. The growth of the fungus is most profuse at 25° to 28° and ceases at 35°. This is believed to be the first definite record of *P. cryptogea* in the United States.

Troy (Zeliaette). **Aster yellows and its control.**—*Flor. Exch.*, lxxxv, 16, pp. 13, 17, 3 figs., 1935.

This article is a résumé in popular terms of Kunkel's investigations into aster yellows [*R.A.M.*, x, p. 734; xii, p. 136], carried out at the Boyce Thompson Institute for Plant Research, and is issued as Professional Paper, Vol. 1, No. 28 of that Institute.

Dana (B. F.) & McWhorter (F. P.). **An outbreak of curly top on Pansy.**—Abs. in *Phytopathology*, xxv, 9, p. 894, 1935.

A serious outbreak of curly top on the pansy [*Viola tricolor*], charac-

terized by dwarfing and rosetting of the shoots and diminution of flower size and seed production, affected an important seed industry in Oregon in 1934, 20 per cent. of the plants in a five-acre field showing severe injury on 6th July. A blue-flowered foreign strain showed extreme susceptibility with 80 per cent. heavily damaged plants, but otherwise no differences in varietal reaction were observed. Many of the diseased plants died prematurely. All the plants examined on 6th July bore large numbers of adults and nymphs of the beet leafhopper, *Eutettix tenella*, indicating, in conjunction with the severity of the symptoms on pansy, that the latter is a favourable host both for the insect and for the curly top virus [*R.A.M.*, xiv, p. 813]. Infection was not found to be transmitted by the seed.

BLUMER (S.). **Infektionsversuche mit Erysiphe hyperici (Wallr.) Fr.** [Inoculation experiments with *Erysiphe hyperici* (Wallr.) Fr.]—*Mitt. naturf. Ges. Bern, 1934*, pp. xxxi–xxxiii, 1935.

Most of the Swiss species of *Hypericum* are liable to infection by the conidial (*Oidium*) stage of *Erysiphe hyperici* [*E. polygoni* sensu Salmon], the perithecia of which are relatively infrequent. In a series of tests in 1933 and 1934 on 27 species belonging to five sections of the genus, all but two (*H. olympicum* and *H. erectum*) of the 16 comprised in *Euhypericum* were more or less susceptible, including *H. humifusum*, which Hammarlund [in Sweden] found immune in 1925 [*R.A.M.*, iv, p. 431]. *H. olympicum* was observed showing spontaneous infection next to diseased *H. montanum* in the Berne Botanic Garden in 1919, so that its resistance in these trials cannot be regarded as absolute. With one doubtful exception, none of the species in the sections *Norysca*, *Roscyna*, and *Myriandra* contracted infection, and only two (again with one questionable exception) in *Androsaemum*, namely, *H. calycinum* and *H. elatum*. *E. hyperici* would thus appear to represent a single physiologic form attacking primarily the *Euhypericum* section and only occasionally found on members of other groups.

TAUBENHAUS (J. J.). **On a black crown rot of greenhouse Snapdragons caused by Myrothecium roridum Tode.**—Abs. in *Phytopathology*, xxv, 10, pp. 969–970, 1935.

Myrothecium roridum [*R.A.M.*, xiv, p. 428] was isolated from greenhouse antirrhinums affected by a destructive crown rot killing over 90 per cent. of the plants at Waco, Texas, in 1933 and 1934. The diseased crowns are water-soaked at first, then become shrunken, dry, and covered with a thin, white mycelium and numerous black sporodochia; finally, the epidermis and cambium rupture and become shredded. Inoculation experiments with the fungus on normal plants gave positive results.

GRANDFIELD (C. O.), LEFEBVRE (C. L.), & METZGER (W. H.). **Relation between fallowing and the damping-off of Alfalfa seedlings.**—*J. Amer. Soc. Agron.*, xxvii, 10, pp. 800–806, 2 figs., 1 graph, 1935.

During an experiment from 1930 to 1935 in Kansas, lucerne seed planted in soils fallowed for periods of one to five years produced less

vigorous seedlings and poorer stands than that sown in soils previously under a rotation of sorghum, maize, wheat, oats, and lucerne. Of the fungi isolated from the roots of affected plants, comprising *Fusarium*, *Helminthosporium*, *Trichoderma*, and *Pythium* spp., only the last-named proved to be pathogenic, the heaviest damage being observed in soils with a hydrogen-ion concentration of P_H 6 to 8 [cf. *R.A.M.*, xiv, p. 588].

GOIDÀNICH (G.). **Osservazioni sopra una malattia del Trifoglio rara in Italia: l'antracnosi da 'Kabatiella caulivora (Kirchn.) Karak'.** [Observations on a Clover disease rare in Italy: anthracnose caused by *Kabatiella caulivora* (Kirchn.) Karak.]—*R.C. Accad. Lincei*, xxii, 7–8, pp. 354–358, 1 fig., 1935.

The writer describes the symptoms of clover anthracnose (*Kabatiella caulivora*) [*R.A.M.*, xiv, p. 241] and discusses the morphology and taxonomy of the causal organism on the basis of recent studies on material of *Trifolium pratense* from Verona. From a cursory perusal of the Italian phytopathological literature this would seem to be the first record of *K. caulivora* in the country, but it is evident from Voglino's description (*Ann. Accad. Agric. Torino*, li, p. 221, 1908) of the disease ascribed by him to *Gloeosporium trifolii* [*R.A.M.*, xi, pp. 100, 147] that *K. caulivora* (*G. caulivorum*) was actually implicated. Associated with the anthracnose fungus in the Verona plants was *Polyspora lini*, a parasite of flax [ibid., iv, p. 129; xii, p. 580], but it was impossible to trace a definite relationship between the two organisms.

MILLER (P. R.). **Fruit and vegetable losses in market and kitchen garden caused by plant diseases.**—*Plant Dis. Reptr Suppl.* 88, 25 pp., 4 figs., 1 diag., 1 graph, 1 map, 1935. [Mimeographed.]

A tabulated account is given of the data resulting from an inquiry conducted in Tennessee during 1932–34 into the nature and extent of the losses due to disease occurring among fruit and vegetable stocks in the hands of the distributors and consumers [cf. *R.A.M.*, xiv, p. 780]. The investigation necessitated the co-operation of a large group of interested persons willing to keep accurate and complete records of purchases and to call attention to all spoiled produce; and the resultant data were evaluated by systematic and uniform methods. The percentage losses sustained by each fruit and vegetable are specified and the causes indicated but no computation is made of the total loss.

In a discussion of the results of the survey the writer comments on the ignorance of most of the dealers interviewed of even the most elementary principles of biology, this lack of knowledge being indirectly responsible for a considerable proportion of the losses sustained both by distributors and consumers. For instance, a shipment of oranges arriving in fair condition was unloaded by the shovel method and held for ten days in common storage on account of over-stocking; the injuries received in unloading together with the ubiquitous blue mould (*Penicillium*) [*italicum*: ibid., xiv, p. 754] spores in the atmosphere caused a loss of 500 out of 600 bushels.

KELSALL (A.). **The iron sulphate and lime-sulphur mixture as a spray.**—*Canad. Chem. Metall.*, xix, 9, p. 239, 1935.

A mixture of iron sulphate (10 or 6 lb.), lime-sulphur ($2\frac{1}{2}$ or $1\frac{1}{2}$ galls.), and calcium arsenate (4 to 5 or 3 to 4 lb.) per 100 galls. water has been extensively used for the last few years in the Maritime Provinces of Canada with very satisfactory results in the control of orchard pests and diseases [chiefly apple scab, *Venturia inaequalis*: *R.A.M.*, xiii, pp. 310, 682]. The best of the spreaders so far tested for incorporation with this mixture is lignin pitch at the rate of 3 or 4 lb. per 100 galls. In a series of tests covering many years Bordeaux mixture proved slightly more effective as a fungicide than the iron sulphate and lime-sulphur mixture, but for practical purposes the difference may be disregarded. Both Bordeaux and lime-sulphur with lead arsenate are liable to cause russeting of the fruit [ibid., xv, p. 37], a drawback not associated to any appreciable extent with the iron sulphate treatment. Care must be taken, however, not to apply the last-named too late in the season, when the colour of the fruit may be adversely affected.

GRAM (E.) & STAPEL (C.). **Forsøg med Foraarskarbolineum.** [Experiments with spring carbolineum.]—*Medd. Forsøgsv. Plantek. Kbh.*, 242, 3 pp., 1935.

Very good control of *Sclerotinia laxi* f. *mali* on apples [*R.A.M.*, viii, pp. 179, 254; xiv, p. 703] was given in the official tests in Denmark in 1934 by spring applications of abolin (a product of German origin taken over by the Danish firm J. Svendsen) dissolved in Bordeaux mixture, the action of the substance in lime-sulphur being slightly weaker. In 1935 abolin, krimpol, and mentin (the two last obtainable, respectively, from A/S Carbokrimp and Dansk Olieindustri) were all effective for the same purpose at the rate of 10 l. in 90 l. Bordeaux mixture (2–1–100), reducing the incidence of infection from between 8 and 9 to between 1 and 2 per cent. In mild attacks the preparations may be used in lime-sulphur at the rate of 6 instead of 10 l. This group of fungicides is known as 'spring carbolineum' in contrast to the ordinary winter preparations of the same type [ibid., xiv, p. 597].

CROWELL (I. H.). **The hosts, life history and control of Gymnosporangium clavipes C. and P.**—*J. Arnold Arbor.*, xvi, 4, pp. 368–410, 6 pl., 2 graphs, 1 map, 1935.

A fully tabulated account is given of the author's studies, conducted over a period of four years in the Arnold Arboretum, of quince rust, *Gymnosporangium clavipes* (also known as *G. germinale* [*R.A.M.*, xiii, p. 247], a name based on the aecidial stage), found only in North America.

Inoculations and field observations on approximately 700 species and varieties in 13 genera of Pomaceous plants showed that 480 species and varieties were susceptible, distributed among the following genera: *Amelanchier*, *Amelosorbus*, *Aronia* [*Amelanchier*], *Chaenomeles* [*Pyrus*], *Crataegomespilus*, *Crataegus*, *Cydonia*, *Malus* [*Pyrus*], *Photinia*, *Pyrus*, and *Sorbus* [*Pyrus*]. Similar data regarding the genus *Juniperus* as well as records in the literature showed the following to be susceptible,

viz., *J. communis* and its vars. *depressa*, *hibernica*, and *montana*, *J. horizontalis*, *J. sabina*, *J. scopulorum*, and *J. virginiana*. Both classes of hosts occur over most of the north-temperate region.

On Pomaceous hosts the disease occurred most frequently on the fruits, less so on the twigs and buds, causing hyperplastic distortion, and was rarely found on the leaves, on which it was confined to small, usually partially necrotic spots. The infected buds, besides being swollen, were forced to develop more than is usual for the current season. On some fruits, particularly apples, the disease was limited to small hypoplastic lesions, usually at the blossom end. The flowers and fruits of certain Pomaceous hosts were found to be susceptible only for a brief period after being released from the buds.

On its *Juniperus* hosts the rust, though most abundant on one- to five-year-old twigs was also found on the leaves, branches, and main trunk. The diseased leaves were discoloured and slightly swollen, and were usually killed in one or two years. On the twigs and branches the disease was perennial for several years; they were usually girdled and covered with a thick, flaky, or furrowed, blackened bark. On the main trunk the disease was usually confined to elongated, swollen patches.

The life-history of the fungus is essentially the same as that of other species of the genus. The optimum temperature for the germination of the aecidiospores was about 15° C. In forced buds of aecidial hosts the mycelium was systemic, progressively developing spermogonia, rarely aecidia, as the buds elongated. On *Juniperus* hosts the mycelium was confined to the epidermis of the leaves and the phellogen of the twigs, branches, and main trunk. Teleutosori were produced annually on infected organs. Measurements of the aecidiospores are given as 32·2 by 34·4 μ with extremes of 28·4 to 42·3 by 26·7 to 37·4 μ; those of the peridial cells as 55·6 by 14·5 μ (33·4 to 83·5 by 10·4 to 23·4 μ); and the teleutospores as 44·5 by 22·7 μ (33·0 to 57·8 by 16·5 to 33·0 μ), 94·8 per cent. of the last-named being bicellular and the rest unicellular.

Control consists in the selection of resistant species, planting a screen of tall, non-susceptible trees round groups of alternate hosts, eradicating all hosts over a radius of at least half a mile, removing the infected parts, and spraying with linco colloidal sulphur [ibid., xiv, p. 684] both Pomaceous and *Juniperus* hosts.

MacLachan (J. D.). **The dispersal of viable basidiospores of the Gymnosporangium rusts.**—*J. Arnold Arbor.*, xvi, 4, pp. 411–422, 2 figs., 1935.

Evidence having been obtained that the basidiospores of certain *Gymnosporangium* rusts in North America can produce infection on alternate hosts seven or eight miles distant from the source of inoculum, spore collections were made by aeroplane at different altitudes over red cedars [*Juniperus virginiana*] infected by *G. juniperi-virginianae* [*R.A.M.*, xiv, p. 771] immediately after a rainy period, on 5th May, 1935. The results obtained [which are tabulated and discussed] showed that viable basidiospores of *G. juniperi-virginianae* were present in the air at altitudes up to at least 2,000 ft. In laboratory tests the basidiospores were killed at 0 per cent. humidity at all temperatures in 22 hours, and at temperatures over 30° C. under all humidity conditions

within the same period. At humidities over 25 per cent. and temperatures below 25° they could live long enough to blow many miles while still remaining viable, and such conditions prevail locally during the normal dispersal of these rusts. Experience has shown, however, that the eradication of red cedars within a radius of one to two miles will, as a rule, fully protect the Pomaceous host from harmful infection by species of *Gymnosporangium*.

TINDALE (G. B.) & TROUT (S. A.). **The preservation and storage of fruit.**—*J. Aust. Inst. agric. Sci.*, i, 3, pp. 109–111, 1935.

The authors give a few brief notes on the results of the researches carried out in Melbourne on the longevity of various fruits in cool storage, by the Australian Council for Scientific and Industrial Research in collaboration with the Victorian Department of Agriculture. The results with pears have already been noticed from another source [*R.A.M.*, xiii, p. 709]. The behaviour of plums in cool storage [cf. ibid., xiv, p. 321] is very similar to that of pears; they also require picking when green but fully developed and storage at a temperature from 30° to 32° F., and must be removed from storage before the climacteric is passed to avoid the development of mealiness and internal browning; even under such conditions the storage life of most plum varieties is only seven or eight weeks, while that of peaches [cf. ibid., xiv, p. 773] is even shorter. Both oranges and apples [cf. ibid., xiv, p. 41] are usually picked closer to their climacteric than pears, but they can be stored for a longer period afterwards, the respiration curve falling slowly. Subsequently respiration increases again, but shortly after the orange in particular appears to lose all natural resistance to mould [*Penicillium* spp.] attack. The study of the respiration curve is regarded as practically essential to a proper understanding of storage behaviour.

HEUBERGER (J. W.). **Fruit-rotting Sclerotinias—IV. A cytological study of Sclerotinia fructicola (Wint.) Rehm.**—*Bull. Md agric. Exp. Sta.* 371, pp. 167–189, 4 pl., 1 fig., 1934. [Abs. in *Exp. Sta. Rec.*, lxxiii, 6, pp. 801–802, 1935.]

The microconidia of *Sclerotinia fructicola* [*R.A.M.*, xv, p. 103] described in this cytological study of the fungus are uninuclear and produced in chains on bottle-shaped sterigmata, from which they are severed by the formation of a septum in the neck. These organs developed more abundantly at P_H 5·5 and 7·9 than at 4·1, the chief factor determining their production being a limitation in carbohydrate supply. The occurrence of the microconidia on the surface of mummies in late winter may indicate that they fertilize the apothecial fundaments, then in course of formation just below the sclerotial surface. Cytological details are given of the three distinct types of nuclei occurring in the life-cycle of *S. fructicola* and of ascus development.

WILLISON (R. S.) & CHAMBERLAIN (G. C.). **Studies in fruit diseases. VIII. Preventing Peach canker.**—*Circ. Dep. Agric. Can.* 92, 8 pp., 4 figs., 1935.

A popular discussion is given of cultural practices in Ontario

orchards in relation to the serious and widespread peach canker caused by *Valsa cincta* [*R.A.M.*, xiv, p. 594 and next abstract].

The later stages of the disease are easily recognizable by the shrivelled, blackish, loose, dead bark and the presence of several more or less concentric ridges round the canker, often accompanied by gummy exudations. Less familiar is the incipient phase developing in the spring and marked externally by slightly sunken, sometimes discoloured areas, corresponding to moist, brown lesions in the bark tissue, which dry out during the summer. In view of the fact that infection by *V. cincta*, which takes place through wounds, is most prevalent shortly before and after leaf fall, it is advisable to delay pruning at any rate until January and preferably until March, when the cuts are likely to heal thoroughly and rapidly. A prolific source of trouble is carelessness in cleaning up the cuts, in the manipulation of implements, and in the removal of dead wood. Care should also be taken to avoid damaging the trees during cultural operations and measures should be adopted to combat the insect pests liable to inflict injuries.

Over a five-year period three plots in the orchard of the Dominion Laboratory of Plant Pathology, St. Catharines, have been sown with a cover crop on 15th June, 15th July, and 15th August. Records show a striking increase in the number of cankers and winter injuries in the plots cultivated until 15th August, and it is therefore recommended that the season of open cultivation in peach orchards should cease in the first week of July to admit of proper maturation of the trees before winter.

Common sites of infection by *V. cincta* are the twig and spur lesions caused by the brown rot fungus [*Sclerotinia fructicola*], the summer treatment of which will thus automatically help to control canker.

Large, irremovable cankers situated at crucial points on the trunk or main branches should be thoroughly cleaned out in the spring, and immediately afterwards disinfected with mercuric chloride 1 in 500 and painted with a thin paste of white lead or asphalt and boiled linseed oil.

STEVEN (W. F.). **Studies on the cultural behaviour and pathogenicity of a strain of Valsa.**—*Phytopath. Z.*, viii, 5, pp. 489–505, 1 pl., 5 graphs, 1935.

A tabulated description is given of the author's studies on the cultural behaviour and pathogenicity of a strain of *Valsa* isolated from *Sorbus* [*Pyrus*] *chamaemespilus* by G. Défago and placed by him in the subgenus *Leucostoma*, affinities with *V. nivea* and *V. persoonii* being noted. The rate of growth as estimated by the dry weight of mycelium increased from 3° C. to about 33° and then fell sharply, the amount produced indicating a physiological distinction from *V. cincta* [see preceding abstract], *V. nivea*, and *V. persoonii*. The optimum temperature for radial growth was around 27° and none occurred at 36° while the optimum hydrogen-ion concentration was between P_H 4·8 and 5·1. Low atmospheric humidity hastened the development of spores in agar cultures provided pycnidial growth is not checked while no spores were formed above 82·7 per cent. humidity.

Inoculation experiments with *V. nivea* from poplar, *V. persoonii*

from peach and Mahaleb cherry, *V. cincta* from apricot, and the strain from *P. chamaemespilus* on pear, *S.* [*P.*] *aucuparia*, and *S.* [*P.*] *aria* var. *majestica* by Togashi's burning method [ibid., iv, p. 612] showed *V. cincta* to be the most strongly pathogenic, but even this species spread exclusively in tissues weakened by other causes. In this respect as in others the *P. chamaemespilus* strain is intermediate between *V. nivea* and *V. persoonii*.

THORNTON (J. K.). **Blackberries: possible source of streak infection in Black Raspberries.**—*Phytopathology*, xxv, 10, pp. 959–961, 1935.

During the summer of 1932 four cases of severe infection by streak on black raspberries [*Rubus occidentalis*: *R.A.M.*, xi, p. 381] growing in close proximity to blackberries were observed in plantings entered for certification in Pennsylvania, and a similar instance occurred in the following year. Only mild symptoms of the disease [ibid., xii, p. 230] were detected in black raspberry plantings at a distance of 500 ft. or more from blackberries. In one case the percentage of streak on 1st July, 1932, in two rows of Eldorado blackberries was 1, while on the same date it amounted to 30 in two adjoining rows of Plum Farmer black raspberries, to 10 in the three next rows of black raspberries (Cumberland), and to 2 in the three rows (Plum Farmer) at the greatest distance from the blackberries, the corresponding figures for 1st August being 1, 60, 15, and 4, respectively. Records are available to show that severe streak infection in black raspberries is consistently associated with proximity to blackberries. In two cases the streak percentages in black raspberries adjoining blackberries increased from 6 and 5 per cent., respectively, in 1931 to 30 and 75 per cent., respectively, in 1932. In 1933 all the black raspberries in a planting interspersed with blackberries were diseased but only one blackberry showed suspicious symptoms. However, notwithstanding the frequent absence of the latter, there is considered to be an evident correlation between streak in blackberries and its subsequent spread to *R. occidentalis*.

DARROW (G. M.). **Susceptibility of Raspberry species and varieties to leaf spot (Mycosphaerella rubi) at Beltsville, Maryland.**—*Phytopathology*, xxv, 10, pp. 961–962, 1935.

A table is given showing the relative resistance in Maryland, in comparison with the Latham and Chief, of a number of raspberry species and varieties to the serious leaf spot (*Mycosphaerella rubi*) [*R.A.M.*, xiii, p. 174; xiv, p. 181]. Among those more resistant than Latham may be mentioned *Rubus biflorus*, *R. incisus*, *R. innominatus*, *R. inopertus*, *R. kuntzeanus*, *R. mesogaeus*, *R. niveus*, *R. parvifolius*, *R. phoenicolasius*, *R. rosaefolius*, *R. veitchii*, Van Fleet (*kuntzeanus* × Cuthbert), and various U.S.D.A. and N.Y. selections. Equally resistant with Latham and Chief are four black (*R. occidentalis*) varieties, Bristol, Dundee, Golden King, and Naples, Potomac purple, two U.S.D.A., and four N.Y. selections, while the varieties more susceptible than Latham include Cumberland, Farmer, Perfection, Quillen, and six other black varieties, two red varieties (June and White Queen), and one purple (Royal).

Brooks (A. N.). **A Rhizoctonia bud rot of Strawberry.**—Abs. in *Phytopathology*, xxv, 10, pp. 965–966, 1935.

Rhizoctonia [*Corticium*] *solani* causes a dry rot of the leaves, flower-buds, and petiole and stipule bases of strawberries from November to March in Florida [*R.A.M.*, xi, p. 661; xiv, p. 563]; the older leaves droop and lie flat on the ground and the affected plants may die, though recovery sometimes takes place by means of adventitious buds. The fruits are subject to this rot at any stage of maturity. Healthy plants in sterile soil readily contract the disease on inoculation with the sclerotia of the fungus either through the buds or soil. Control measures should include lowering the organic soil content by the reduction of summer cover crops and either wider spacing of the plants in the beds or later setting to maintain bushes of smaller size and so to provide adequate circulation of air round the plants.

Nolan (R. E.). **Sclerotium rolfsii Sacc. on Strawberries and the effect of certain chemicals on the sclerotia.**—Abs. in *Phytopathology*, xxv, 10, p. 966, 1935.

Sclerotium rolfsii is stated to have caused severe infection of strawberries [*R.A.M.*, iii, pp. 381, 704] during the past three years in the Plant City area [Florida], especially during warm weather. Any part of the plant is liable to attack, though the base of the petiole and stipules is generally the first to be invaded. The fungus then proceeds to destroy the buds, which may or may not be replaced later. Newly set plants are occasionally attacked in the spring, their root systems being covered with a mass of white mycelium and the roots light brown. Sclerotia are sometimes formed after the death of the plants. Some of the small berries show an irregular, light brown, soft spotting on the soil side during the fruiting season. At maturity a profusion of white mycelium is produced, covering the berry and causing a soft rot. When the berry is consumed the mycelium disappears, leaving a mass of sclerotia and strawberry seed on the surface of the soil.

A saturated atmosphere was shown by inoculation tests to stimulate sclerotial germination and infection. Formaldehyde and carbon sulphide were the most effective of the chemicals tested for the destruction of the sclerotia.

Parham (B. E. V.). **Annual Report on Banana disease investigations, 1934.**—*Annu. Bull. Dep. Agric. Fiji*, pp. 41–48, 1935.

During 1934, *Cercospora musae* [*R.A.M.*, xiv, pp. 44, 216] was common on leaves of banana plants in Fiji, but its virulence varied with the growth conditions of the plant and it appeared invariably to be secondary to other adverse factors. The following varieties have so far shown immunity: Lady's Finger, Mysore, Blue Java, Vudi loaloa, Soaqa (*Musa fehi*), 'Jamaica', and Jamaica vula; of the oba varieties, Bawa, Baloa, Sauvai, and Jamani vula show resistance, while of the commercial varieties, one strain of Gros Michel ('Domoloa') and one of Cavendish gave indication of possessing some resistance. A species of *Mycosphaerella* found in association with *C. musae* is thought possibly to be its ascigerous stage.

A species of *Fusarium* identical in all its cultural and morphological characters with *F.* [*oxysporum*] *cubense* was associated with a severe banana wilt; the external symptoms and the effect of the fungus on the plant tissues were characteristic of Panama disease. At Kaivala Bay, Kadavu, devastated plantations covering 50 acres were destroyed by the Department of Agriculture as a precautionary measure. The isolation of a similar species of *Fusarium* from diseased bananas on the mainland of Viti Levu leads the author to conclude that Panama disease and 'Sigatoka' [ibid., v, p. 715] are identical. Satisfactory results in the eradication of diseased stools were given by diesolene oil (S.G. 0·8505, C.F.P. 186°), used at the rate of ½ pint per stool, costing 30*s.* per acre, any suckers that survived the treatment being easily removable by hand.

Cordana [*Scolecotrichum*] *musae* [ibid., xiv, p. 45] and *Uromyces musae* [ibid., xiv, p. 608] are common leaf pathogens of banana in Fiji, the former producing large, diamond-shaped lesions with a yellow margin and the latter characteristic masses of rusty brown spores on the under surface of the leaves of all 'China' bananas and Lady's Finger.

Gloeosporium musarum [ibid., xv, p. 104] was commonly present on the persistent bracts of the Cavendish variety, on the fruits of which it caused spotting; in association with insect infestation it produced severe cracking and rotting of maturing Cavendish fruits. It caused a severe finger-stalk rot and fruit spotting of the Veimama and Cavendish varieties. Young lesions were discernible on fruit at the half stage, infection taking place in the plantation. Preliminary experiments indicated that control is possible by routine spraying at the critical pre-infection stage or by ripening in the dark or in rooms with reduced ventilation, the prevention of infection apparently depending upon an accumulation of the carbon dioxide of respiration.

The role of *Marasmius* sp. [ibid., xiv, pp. 45, 154] as a banana pathogen has still to be established. The mycelium and rhizomorphal strands may be traced well into the sheathing bases of the pseudostem, but penetration does not take place until the moisture content of the tissues has become reduced. Subsequently, the fungus progresses rapidly, the outer, drier leaf bases being quickly rotted, even though no fructifications are present. Sporophores were found from January to June, always abundantly on bananas affected by Sigatoka, their presence emphasizing the morbid condition of the plants. *M.* sp. is thought probably to be a saprophyte with a weakly parasitic tendency.

All the clones of Cavendish bananas appear to be affected by bunchy top [ibid., xiv, p. 112] which may not become manifest except under adverse growth conditions or until fruiting time. Both the disease itself and the vector, *Pentalonia nigronervosa*, are becoming markedly more prevalent, the proportion of plants affected in different localities ranging from 10 to 50 per cent.

Other banana diseases studied included a wilt of plantains from which bacteria only were isolated from discoloured vascular strands, and a spotting of the leaves and petioles of certain plantain varieties attributed to *Fusarium*.

Lady's Finger appears to be identical with the Fillbasket or Mysore banana used as an analysing male parent in breeding work in Trinidad. It is resistant to Sigatoka and very rarely affected by bunchy top.

WILCOXON (F.) & MCCALLAN (S. E. A.). **Fungicidal action of organic thiocyanates, resorcinol derivatives, and other organic compounds.** —*Contr. Boyce Thompson Inst.*, vii, 3, pp. 333–339, 1935.

A tabulated account is given of the results of toxicity tests [cf. *R.A.M.*, xiv, p. 244] of 32 listed organic compounds to the conidia of *Sclerotinia fructicola*, *Botrytis paeoniae* [ibid., xv, p. 99], and *Pestalotia* [*Pestalozzia*] *stellata*. The compounds tested included organic thiocyanates, thiazoles, resorcinol derivatives, and other phenolic compounds, and their fungicidal activity was compared with that of copper sulphate and formaldehyde, the criterion of toxicity being the LD50 [loc. cit.]. The thiazoles, catechol, and protocatechuic acid [ibid., xiv, p. 553] were found to be of comparatively low toxicity, the concentrations required to inhibit the germination of the conidia being so high as to render their use in practice unlikely. The thiocyanates, and the alkyl and acyl derivatives of resorcinol [ibid., xiv, p. 105] proved to be highly toxic, some members of this series being nearly as effective as copper sulphate; potassium thiocyanate, however, was not toxic. Formaldehyde was less toxic than might be expected from its widespread use.

Preliminary greenhouse experiments with tomato leaf mould (*Cladosporium fulvum*) [ibid., xiv, p. 662] indicated that while trimethylene dithiocyanate was equal to Bordeaux mixture and sulphur dust in controlling the disease, in some cases it caused a slight burning of the growing tips; none of the other compounds tested gave satisfactory control.

DE FRANCOLINI (J.). **Observations sur le pouvoir mouillant des bouillies antiparasitaires.** [Notes on the wetting capacity of antiparasitic mixtures.]—*Rev. Path. vég.*, xxii, 4, pp. 284–287, 1935.

In this brief note the author states that experiments have shown that a commercial spreader may lower by varying degrees the surface tension of different insecticidal and fungicidal sprays to which it is added, the same product giving excellent results with one spray and being entirely ineffective for another. Consequently, the effect of any spreader should be determined experimentally before adopting it for practical use with a given spray [cf. *R.A.M.*, xiv, p. 597]. It was further shown that the wetting capacity [ibid., xv, p. 105] of any one spray liquid is only satisfactory when its surface tension has been reduced to or below about 0·65 of that of distilled water, taken as the unit of measurement. With cupric or arsenical sprays, however, lowering the surface tension below the point where these liquids wet the leaf surface tends also to lower their efficacy.

DESRUE [A.]. **Bouillies mouillantes et mouillants.** [Wetting sprays and wetters.]—*Progr. agric. vitic.*, civ, 36, pp. 228–231; 37, pp. 257–262, 1935.

While freely admitting the great interest of laboratory studies on

the wetting capacity of spray liquids (insecticides and fungicides), the author points out that such studies are of little value in agricultural practice in view of the highly complex and infinitely variable environmental conditions met with in the field, as well as of the extremely heterogeneous nature of the sprays themselves, especially of those that are prepared more or less empirically by the growers [*R.A.M.*, xiii, p. 45]. His own extensive practical experience conclusively shows that the amount of a wetting agent (for which he again recommends terpene alcohols (emol) [loc. cit.; ibid., xv, p. 105] as very efficacious and suitable for most crops) to be added to a spray varies considerably with the host plant treated, its stage of growth, and weather and other environmental conditions; this renders the use of a fixed formula undesirable, and in his view, the only way out of the difficulty is that this amount should be empirically determined on a few plants before every application, and at least twice daily even with one and the same crop [see preceding abstract].

PEASE (DOROTHY). **A method for irrigating fungus cultures.**—*Science, N.S.*, lxxxii, 2129, pp. 377–378, 2 diags., 1935.

The author describes a method for renewing the supply of moisture in fungus cultures. A van Tieghem ring is enclosed in the Petri dish and the agar is poured round the ring, which thus becomes an empty glass well in the centre of the plate. Sterile water, introduced into the ring, slowly seeps out into the agar and can be replenished as required. The method is also appropriate for nutritional experiments and may be applied to cultures in Erlenmeyer flasks by using a 2 in. length of glass tubing 18 to 20 mm. in diameter in place of the ring.

BODINE (E. W.). **Sclerotinia wilt of Canada Thistle.**—*Phytopathology*, xxv, 10, pp. 963–964, 1 fig., 1935.

Sclerotinia sclerotiorum was isolated from dying Canada thistle (*Carduus* [*Cnicus*] *arvensis*) plants in Colorado and inoculated with positive results on the same host, potato, tomato, bean [*Phaseolus vulgaris*], lettuce, celery, and sunflower [*R.A.M.*, xiii, p. 638]. On *C. arvensis* the fungus produces within five days soft, grey to dark brown, water-soaked cankers on the roots, to which the persistent lignified tissues impart a shredded appearance. Attempts to destroy the weed by means of the fungus were only partially successful, a vigorous fringe of the thistle advancing ahead of the control agent and forming 'fairy rings'. For this reason, and on account of its wide host range, *S. sclerotiorum* is not adapted for the purpose in view.

PROCTOR (B.). **The microbiology of the upper air. II.**—*J. Bact.*, xxx, 4, pp. 363–375, 1935.

A tabulated account is given of the microbiological results obtained in 30 aeroplane flights near Boston between April and November, 1934 [*R.A.M.*, xiv, p. 326], the journeys being performed between 7 and 9 a.m. The collection apparatus consisted essentially of a rotatory brass plate perforated by six holes in which were inserted disks of oiled paper on a wire screen support, and the air current was arranged

to traverse each paper in turn by rotating the plate. The entire apparatus was sterilized by heat before use. Shortly after the completion of the flight the oiled paper filters were removed to a sterilized glass cell, and after direct examination were shaken up in sterile water from which Petri dishes were then poured.

Aspergillus and *Penicillium* spp. were the most common moulds trapped at altitudes above 10,000 ft., 12 cultures of the former and 6 of the latter being obtained, while representatives of the following genera were also isolated from this series of flights: *Rhizopus*, *Mucor*, *Oospora*, *Monosporium*, *Macrosporium*, *Tilachlidium*, and *Fusarium*.

DALE (H. H.). **Viruses and heterogenesis. An old problem in a new form.**—*Huxley Mem. Lect.*, *1935*, 24 pp., 1935.

After concisely summarizing the history of the filterable or ultramicroscopic viruses [*R.A.M.*, xv, p. 40], with special reference to their biogenetic or heterogenetic origin, the author discusses the evidence for and against the theory of biogenesis. The striking uniformity in the properties and behaviour of the different viruses would seem to contradict the view that at some unspecified level of unitary dimensions the apparently self-propagating infective organisms are transformed into autogenous transmissible toxins. Constantly improving technical methods have already revealed as independent organisms certain infective principles previously unrecognized as such, and there is reason to believe that further advances in this direction will establish the validity of biogenesis as an explanation of the viruses.

THORNBERRY (H. H.). **Particle diameter of certain plant viruses and Phytomonas pruni bacteriophage.**—*Phytopathology*, xxv, 10, pp. 938–946, 1935.

The author explains the technique, discusses the results, and tabulates the statistical data of ultrafiltration analyses, which showed the following viruses and strains thereof to be composed of particles some 15 $\mu\mu$ in diameter according to Elford's method of calculation [*R.A.M.*, xii, p. 646], substituting Mallinckrodt's parlodion (*J. gen. Physiol.*, xviii, p. 143, 1934) for 'necol' as a source of collodion: Johnson's tobacco mosaic 1 and 6 (yellow) [*R.A.M.*, xiv, p. 660; xv, p. 122], Holmes's masked tobacco mosaic [ibid., xiii, p. 399], tomato aucuba mosaic [Johnson's tobacco virus 6: ibid., xiv, p. 261], Kunkel's second attenuated strain of aucuba mosaic [ibid., xiii, p. 648], Jensen's yellow tobacco mosaic [ibid., xiii, p. 329], Valleau's yellow and green ring spots of tobacco [ibid., xiv, p. 812], Wingard's tobacco ring spot [ibid., vi, p. 699], Porter's cucumber mosaic virus 1 [ibid., xiv, p. 811], and Johnson's ring spot of potato [ibid., xiv, pp. 660]. Particles of the tobacco mosaic virus purified by the lead acetate procedure [see below, p. 177] passed membranes of 33·84 $\mu\mu$ pore diameter but not those of 26·27 $\mu\mu$ while the non-purified virus was retained by the former. On the basis of the results with the purified virus, the particles are estimated to measure about 11 $\mu\mu$; the dimensions of the *Phytomonas* [*Bacterium*] *pruni* bacteriophage [ibid., vii, p. 432] were also determined as approximately 11 $\mu\mu$.

RENNER (SOPHIE). **Beitrag zur Kenntnis einiger Wurzelpilze.** [A contribution to the study of some root fungi.]—*Phytopath. Z.*, viii, 5, 457–487, 12 figs., 3 graphs, 1935.

A detailed, tabulated account is given of investigations at the Federal Technical College, Zürich, on mycorrhizal associations in *Salix repens*, *Schoenus ferrugineus*, *Acer platanoides*, and *A. pseudoplatanus*, of which the last-named proved to be the best adapted to synthetic experimentation [cf. *R.A.M.*, xiii, pp. 590, 793].

In *Salix repens* the roots are surrounded with a fungal mantle and infection was found to be confined to the epidermal cells. The roots of *Schoenus ferrugineus* showed dark-coloured, sack-shaped swellings, 4 by 1 to 1·5 mm., tapering towards the tip, without root hairs, and containing a profusion of hyphae, this being apparently the first record of true mycorrhizal tumours in the Cyperaceae. Numerous interwoven hyphae also filled the cortical cells of *A. platanoides* and *A. pseudoplatanus* roots. The fungi were isolated from the root tissues on malt agar and Knop's medium and are subsequently referred to as *Mycelium radicis salicis*, *M. r. schoeni*, and *M. r. aceris* [cf. ibid., xiv, p. 187], the exact determination of their systematic position being impracticable. The three fungi are closely similar in general habit, all forming a white mycelium, the lower strata of which rapidly turn brown, consisting of septate hyphae, 5 to 6 μ in diameter in *M. r. aceris* and *M. r. schoeni* but only 2 to 3 μ in *M. r. salicis*. Conidia [which are not described] are abstricted from the hyphal tips, sometimes in chains, by *M. r. salicis* and *M. r. schoeni*. The addition to Knop's solution of 4 per cent. cane sugar was found to promote growth, which was most abundant in the case of *M. r. schoeni* and least so in that of *M. r. aceris*. In Knop's medium the optimum temperature for the development of *M. r. aceris* was 21° C., while the other two grew best at 24°; *M. r. salicis* was the only one of the three organisms to develop above 27°. On malt agar the optima for *M. r. aceris*, *M. r. salicis*, and *M. r. schoeni* were 21°, 24°, and 21°, respectively; the last-named proved to be the most sensitive to extremes of temperature, its range being only from 9° to 27° compared with 3° to 33° for *M. r. salicis*. All the fungi induced gradual alkalization of the medium during the period of growth, *M. r. aceris* attaining P_H 5·16, *M. r. salicis* P_H 6·70, and *M. r. schoeni* P_H 7·63 in about two months. Cold phosphatide extracts of *Acer* seeds favoured the development of *M. r. aceris*, while hot ones made no difference to it but injured *M. r. salicis*. Ammonium sulphate and asparagin were the best sources of nitrogen, the assimilation of which from the atmosphere appears to be improbable.

The facts that the mycorrhizal fungi under observation are capable of killing weak plants, e.g., water cultures, but not vigorous individuals rooted in soil, and that they are not essential to the germination of their respective hosts, are considered to support the view that they are parasites.

SCHOPFER (W. H.). **Facteurs de croissance et vitamines chez les champignons.** [Growth factors and vitamins in fungi.]—*Mitt. naturf. Ges. Bern, 1934*, pp. xxxv–xxxvii, 1935.

The author describes the reaction of *Phycomyces* sp. and several other

fungi (including *Mucor ramannianus* [*R.A.M.*, xiv, p. 247], *Absidia ramosa*, *A. orchidis*, *Mucor mucedo*, *Rhizopus suinus*, and *Saccharomyces cerevisiae*), to the 'growth factor' contained in yeast, wheat germ, some pollens, and the like, and consisting of vitamins B_1 and B_2, bios [ibid., xv, p. 109], and other substances. The conclusion is reached that at least two factors are involved, one with a specific action (B_1) and the other with a more generalized effect (growth factor of Mucorineae or M). Evidence was obtained indicating that *P.* sp. is able to synthesize B_1 itself. It is noteworthy that the species most dependent on the presence of vitamin B_1 are more or less parasitic and incapable of an independent existence.

The results of experiments carried out by Burgeff with extracts of the growth factors supplied by the writer in 1933 are stated further to indicate the possibility of replacing the orchid endophyte [*Rhizoctonia repens*: ibid., xv, p. 108] by M but not by B_1.

RAISTRICK (H.). **Division of biochemistry and chemistry as applied to hygiene.**—*Rep. Lond. Sch. Hyg., 1934–5*, pp. 27–30, 1935.

In this account of work carried out at the London School of Hygiene and Tropical Medicine, the author indicates the progress made during 1934–5 in the biochemical investigation of various metabolic products of fungi, including new derivatives formed by species of *Helminthosporium*; ravenelin, a pigment produced by *H. ravenelii* [*R.A.M.*, x, p. 463]; byssochlamic acid formed by *Byssochlamys fulva* [ibid., xiv, p. 775]; two crystalline pigments of *Fusarium culmorum*; and a number of products of species of *Penicillium* and *Aspergillus*. The papers published by members of the Division during the year are listed on pp. 58–59 of the Report.

MORRIS (H. E.) & YOUNG (P. A.). **Potato diseases in Montana.**—*Bull. Mont. agric. Exp. Sta.* 300, 49 pp., 24 figs., 1935. [Abs. in *Exp. Sta. Rec.*, lxxiii, 6, p. 797, 1935.]

This bulletin (a revision of No. 227 in the same series) is stated to have been prepared chiefly for the use of growers and contains, in addition to previously published observations on the chief potato diseases and their control in Montana [cf. *R.A.M.*, x, p. 263; xiii, p. 257], a description of a physiological mottling affecting mainly the early-formed leaves. A key to the tuber, stem, and leaf diseases is appended.

ESNAULT (O.) **Les maladies de dégénérescence de la Pomme de terre.** [Potato degeneration diseases.]—*Vie agric. rur.*, xxiv, 41, pp. 235–236, 1935.

Popular notes are given on leaf roll and crinkle of potatoes, which are stated to be causing steadily increasing losses in the Department of Seine-Inférieure, France [*R.A.M.*, x, p. 266; xii, p. 491, *et passim*], and on their control by means of selection.

WARTENBERG (H.), HEY (A.), & URHAN (O.). **Die elektrometrische Pflanzgutwertbestimmung der Kartoffelknolle. I. Mitteilung.** [The electrometric determination of the seed value of the Potato tuber. Note I.]—*Arb. biol. Reichsanst. Land- u. Forstw., Berl.-Dahl.*, xxi, 3, pp. 331–362, 1 fig., 1 diag., 7 graphs, 1935.

This is a highly technical, tabulated discussion on the foundations of the electrometric method of determining the value of potato tubers for seed, with a view to the elimination by this means of individuals suffering from 'degeneration' [*R.A.M.*, xiv, pp. 78, 388, and cf. next abstract]. A description is given of the necessary preliminaries to the work of measurement, the apparatus used, and the process of determination, followed by an account of the conditions permitting the comparison of potential values measured by different platinum electrodes.

Special investigations were required to explain the division of the measuring process into two parts, viz., potential drift and potential constancy, the former being interpreted in part as a sequel to inevitable polarization effects and partly as a function running its course in the potato tissue emulsion. It was impossible to decide, within the limits of these studies, whether potential constancy corresponds to the true potential formation of an active, unchangeable system, or if it is a drift of which the extent cannot be gauged in the 30 to 40 hours occupied by the measuring process.

KLINKOWSKI (M.). **Die Bechholdsche Kupferprobe als diagnostisches Hilfsmittel zur Beurteilung des Gesundheitszustandes von Kartoffelknollen.** [The Bechhold copper test as a diagnostic aid in the determination of the state of health of Potato tubers.]—*Phytopath. Z.*, viii, 5, pp. 421–455, 8 figs., 2 graphs, 1935.

In the application of the Bechhold copper test for the determination of the state of health of potato tubers in respect of degeneration [*R.A.M.*, xiv, p. 785 and cf. preceding abstract], certain conditions must be scrupulously observed. For instance, the sheet-copper strips must be smooth, thin, and sharp-edged, and should be carefully wiped before use. Tubers for testing purposes must be whole and free from injury or external symptoms of disease, while those that have undergone excessive evaporation in storage should be excluded. The results of greenhouse and field trials indicate a limited diagnostic value for the method, the practical application of which is restricted, however, by the lack of uniformity in the data obtained with tubers of different varieties and from divergent localities. Pending further improvements in the experimental technique, therefore, the copper strip method should only be regarded as an auxiliary means of judging potato deterioration.

COSTANTIN (J.). **La cultivation de la Pomme de terre au Maroc.** [Potato cultivation in Morocco.]—*C. R. Acad. Agric. Fr.*, xxi, 24, pp. 932–933, 1935.

The information in this note is stated to be based on recent researches by E. Miège, who has ascertained that potato cultivation in Morocco

dates back to before 1830 in the region of Fez. The crop is grown by the natives exclusively in mountainous regions at an altitude of 850 to 1,700 m. above sea-level, where the very high yields (up to 35,000 kg. per hect.) compare favourably with those obtained in the plains at Rabat [cf. *R.A.M.*, xiv, p. 785]. Not a sign of degeneration has been observed notwithstanding the repeated use for indefinite periods of tubers of the same variety.

BAWDEN (F. C.). **The relationship between the serological reactions and the infectivity of Potato virus 'X'.**—*Brit. J. exp. Path.*, xvi, pp. 435–443, 1935.

Continuing his serological studies of the potato virus X [*R.A.M.*, xiv, p. 713], the author gives details of experiments with Salaman's S strain of the virus, which is serologically indistinguishable from the G and L strains [ibid., xii, p. 581] but differs from them in that it produces local necrotic lesions on *Nicotiana glutinosa*. The results showed that a close direct relationship exists between the antigen content of purified suspensions of the strain S, as measured by their optimal flocculation points with antisera, and their virus content, as measured by the local lesion method. In the majority of the experiments the strengths of the suspensions were found to lie in the same order when compared by both methods, while in some tests the relation between the dilution of antiserum in the optimal tube and the number of local lesions produced was almost linear. The relationship, however, was found to hold only when the suspensions compared were prepared in the same manner, and, furthermore, the two methods of estimating concentration gave different results when different mixtures of strains of potato virus X were compared. It is believed that the antisera provide a quantitative method of working with such viruses, and that they also afford a reliable estimate of the total virus in a mixture of strains, where the results from lesion counts would be misleading.

Inactivation of the virus by heating the suspensions above 66° C., by ageing *in vitro*, or by 85 per cent. alcohol was accompanied by the loss of flocculating power with antiviral sera. Formalin inactivated the suspensions but left the flocculating power unimpaired, while phenol greatly reduced and altered the flocculation but did not completely destroy it. Certain precipitants had the same effect on both the antigen and the virus.

BLODGETT (F. M.) & COWAN (E. K.). **Relative effects of calcium and acidity of the soil on the occurrence of Potato scab.**—*Amer. Potato J.*, xii, 10, pp. 265–274, 2 graphs, 1935.

No evidence was yielded in the writers' recent experiments [the results of which are tabulated] on the relation of the hydrogen-ion concentration of the soil to potato scab (*Actinomyces*) [*scabies*] in New York State [*R.A.M.*, xiv, p. 716] that lime (as calcium oxide, sulphate, or carbonate) has any direct influence on the disease apart from increasing the alkalinity of the soil (a gravelly silt loam) [ibid., xiii, p. 537]. The incidence of infection was reduced by the admixture with the soil of excessively heavy applications of calcium oxide (30 or 60 gm. per 3,000 gm. soil), the proportion of clean tubers in the two series being

47 and 91 per cent., respectively, compared with none in the non-limed soil; these treatments brought the P_H values to 8·5 and 9, respectively, but they are probably impracticable on a large scale.

Seto (F.). **Beiträge zur Kenntnis der 'Bakanae'-Krankheit der Reispflanze.** [Contributions to the knowledge of the 'bakanae' disease of the Rice plant.]—*Mem. Coll. Agric. Kyoto* 36, 81 pp., 5 figs., 1 graph, 1935.

The outcome of the writer's five-year studies [full details of which are given and the resulting data tabulated] on the 'bakanae' disease of rice (*Gibberella fujikuroi*) in the Kyoto district of Japan [*R.A.M.*, xiv, p. 653; xv, p. 2] convinces him that descriptions of the symptoms in the phytopathological literature are to some extent misleading. The disorder is responsible, not only (as its name implies) for elongation but also for occasional stunting of the plants, while the fungus may also be present in the host without giving rise to any external signs of infection. Cultures of the organism isolated from all three types of diseased material proved capable of inducing the typical growth acceleration symptoms. In soil inoculation experiments elongated seedlings developed only under damp conditions, arrested growth being a feature of the infected plants in dry ground. Similar observations were made in respect of grain inoculation trials. In symptomless carriers of the disease the fungus is aggressive [cf. ibid., xiii, p. 390] but not virulent, and it is not so much the failure to contract the disease that distinguishes these carriers as the absence of reproductive organs of the fungus which naturally minimizes the risk of infection.

G. fujikuroi was inoculated with positive results into the stems of rice plants, infection occurring not only at or shortly after flowering but also, though not so profusely, at a much later date. The presence or absence of glumes did not appreciably influence the incidence of infection among the grains in panicles inoculated through the flowers. It was further shown that even externally sound grains may be heavily parasitized. Grain infection is predominantly, if not exclusively, of external origin.

In the 'bakanae' disease the host suffers from the combined effects of flower and seedling infection of the type described by Zade as 'flower-seedling infection' [ibid., viii, p. 559]. The symptoms induced by artificial inoculation through the flower are more clearly marked and correspond better with the natural features of the disease than those resulting from grain or soil inoculation. The optimum soil temperature both for growth and the development of infection in rice seedlings inoculated through the flowers was found to be 35° C.; 'bakanae' symptoms were still apparent at 25° but not as a rule at 20°, while at 40° only sparse germination of the infected seedlings occurred. *G. fujikuroi* develops well at a temperature range of 24° to 32°, with an optimum at 28°; at 35° growth is considerably slower. It is evident from these data that the maximum incidence of infection coincides, not with the optimum for mycelial growth, but with that for host development. At low soil temperatures the vigour of the seedlings arising from the grains of panicles inoculated through the flowers was impaired, and at the same time the 'bakanae' symptoms

were modified. The presence of the fungus, however, was established in these under-developed plants as well as in those of seemingly normal aspect. The individual examination of seedlings produced by flower-infected grain is regarded as essential to the solution of breeding problems, the systematic study of which is, however, still at the outset.

A six-page bibliography is appended.

VANDECAVEYE (S. C.) & ALLEN (M. C.). **Microbial activities in soil: II. Activity of specific groups of microbes in relation to organic matter transformation in Palouse silt loam.**—*Soil Sci.*, xl, 4, pp. 331–343, 4 graphs, 1935.

A detailed account is given of investigations carried out at Washington Agricultural Experiment Station into the activity of specific groups of micro-organisms and their functions in the transformation of organic matter in Palouse silt loam cropped for nine years continuously to wheat. In the course of the work it was found that during the first stages of decomposition of the organic residue in the soil a sequence of activity occurred, the bacteria leading as a group, but being closely followed by *Actinomyces* and fungi. As the number of fungi did not increase materially during the first four or five days they were presumably unable to compete with the other groups present at that time. The cellulose-decomposing bacteria and *Azotobacter* did not increase in numbers until the activity of these organisms had subsided. Both bacteria and *Actinomyces* as well as the fungi took an important part in the decomposition of the hemicellulose and cellulose compounds [*R.A.M.*, v, p. 763; xii, p. 393].

AJREKAR (S. L.) & OZA (J. D.). **Observations on Glomerella cingulata (Stoneman) S. & V. Sch. parasitic on Tinospora cordifolia Miers.**—*J. Univ. Bombay*, iii, 5, pp. 56–64, 2 pl., 1935.

The authors state that, besides being commonly attacked by a species of *Cercospora* [*tinosporae*: see next abstract], the leaves of *Tinospora cordifolia* (a plant much used in Indian medicine) also frequently bear slightly raised, dark dots, generally arranged in rings, consisting of acervuli of a species of *Colletotrichum* with conidiophores, 13 to 16 by 3 to 4 μ in diameter; slightly curved conidia, somewhat pointed at both ends [falcate], pink in mass, and measuring 16 to 17 by 3 to 4 μ; and numerous dark brown setae, 60 to 150 by 4 to 8 μ. This stage was shown to be genetically connected with *Glomerella cingulata* [cf. *R.A.M.*, xv, pp. 104, 109] the perithecia of which are formed on overwintered diseased *T. cordifolia* leaves in nature, and were also produced in cultures from single conidia on glucose-peptone agar, while mono-ascospore cultures developed the *Colletotrichum* stage. The perithecia formed both in nature and in pure culture measure 80 to 140 μ in diameter; the asci are clavate, sessile, 44 to 67 by 7 to 12 μ, and contain eight, roughly distichous, hyaline, continuous, and more or less curved ascospores, 13 to 19 by 4 to 7 μ. The pathogenicity of both stages to *T. cordifolia* was demonstrated by successful artificial inoculations.

AJREKAR (S. L.) & OZA (J. D.). **A study of Cercospora tinosporae Syd. and its associated pycnidial and perithecial stages.**—*J. Univ. Bombay*, iii, 5, pp. 65–78, 3 pl., 1935.

A widespread and severe disease of *Tinospora cordifolia* in the vicinity of Ahmedabad, characterized by the presence on the leaves of numerous, single at first but later coalescing, angular or irregularly elongated spots, powdery and white on the under and bright yellow on the upper surface, and 0·5 to 7 mm. in diameter, was shown to be caused by *Cercospora tinosporae* Sydow [see preceding abstract], recorded in 1916, from the Philippine Islands. The conidiophores are hypophyllous, hyaline, one- to three-septate, straight but often bent and geniculate, bearing a prominent scar at each geniculation, and 54 to 98 by 4 to 6 μ in diameter. The conidia are hyaline, long and slender (35 to 55 by 4 to 7 μ), rounded at the base and tapering at the apex, and 0- to (most commonly) 3-septate. In culture the fungus produced pycnidia of the *Phoma* type, 35 to 118 μ in diameter, very similar to those found during the winter on fallen, spotted *T. cordifolia* leaves (40 to 120 μ), the pycnospores being cylindrical or rod-shaped, and 4 to 7 by 3 to 4 μ both in culture and in nature. Overwintered *T. cordifolia* leaves affected with *C. tinosporae*, showed the presence on them in the spring of perithecia of the *Mycosphaerella* type, ascospores of which produced a sterile mycelium in culture, strongly resembling that of *C. tinosporae*, and indicating a genetic connexion between the three forms.

The pathogenicity of *C. tinosporae* could not be tested on *T. cordifolia* seedlings, since the majority of these, even when raised from surface sterilized seeds, developed the characteristic spotting, suggesting that the disease is seed-borne. Successful infections, with subsequent reisolation of the fungus, were obtained, however, from inoculations made on healthy cut branches and leaves of the host, all controls remaining healthy. The fungus penetrated the epidermal cell-walls directly, and did not enter through the stomata.

UNAMUNO (L. M.). **Notas micológicas. XI. Algunas especies interesantes di micromicetos de Vizcaya.** [Mycological notes. XI. Some interesting species of micromycetes from Biscay.]—*Bol. Soc. Esp. Hist. nat.*, xxxv, 8, pp. 423–436, 8 figs., 1935.

An annotated list is given of 36 species of fungi collected in the province of Biscay, Spain, in 1932 and 1934 [*R.A.M.*, xiv, p. 396], including four species and one variety considered to be new to science. *Melampsora larici-epitea* [ibid., xi, p. 756] was found on leaves of willow (*Salix nigricans*) (a new host for the country); *Peronospora cytisi* L. Rostrup on foliage of *Cytisus laburnum*; *Phyllosticta pirina* [ibid., xi, pp. 114, 159] on pear leaves; and *P. advena* Pass. on those of *Robinia pseud-acacia*, the three last-named being new to Spain.

Sphaeronema bustinzae n.sp. [with a Latin diagnosis], forming ellipsoid or angular, light brown, indistinctly delimited lesions on white clover (*Trifolium repens*) leaves, is characterized by globose or sphaeroidal-depressed pycnidia, 100 to 180 μ in diameter, with straight or flexuous beaks, 86 to 100 by 60 to 69 μ, with round ostioles, 10 to 16 μ in diameter, and a membranaceous sheath composed of polygonal

cells, 6·5 to 12 μ in diameter; and hyaline, continuous, cylindrical, straight or somewhat curved, pluriguttulate spores, 17 to 25 by 4 to 5 μ, rounded at both ends and slightly tapering at one. The same host is attacked by *Uromyces flectens*.

Fabraea maculata [ibid., xiv, p. 772] in its imperfect stage, *Entomosporium maculatum* (also new to Spain), causes severe damage to quinces, especially in damp situations.

Gäumann (E.) & Jaag (O.). **Über Kleinarten aus dem Formenkreis der Puccinia campanulae.** [On subspecies from the form-cycle of *Puccinia campanulae*.]—*Hedwigia*, lxxv, 3, pp. 121–129, 3 graphs, 1935.

On the basis of their examination of material of *Puccinia campanulae* sensu lato on various species of *Campanula* the authors subdivide the rust into six species as follows. *P. campanulae* on *C. rapunculus* (Swiss and German specimens) is retained as the type species; the light brown, broadly ellipsoid, smooth or verrucose teleutospores measure 19 to 36 by 10 to 22 μ, average 28·7$\pm$2·2 by 15·3$\pm$1·4 μ. The form occurring on *C. cochlearifolia* Lam. [*C. caespitosa* Scop.] in Switzerland and Germany differs from the foregoing in its larger and distinctly verrucose teleutospores (averaging 30·1$\pm$3·7 by 16·6$\pm$2·0 μ) and is named *P. rytzii* n.sp. *P. campanulae herminii* G. Fragoso on *C. herminii* in Spain is characterized by exceptionally wide and strikingly verrucose teleutospores, 29·2$\pm$2·2 by 18·0$\pm$1·6 μ. The teleutospores of *P. campanulae rotundifoliae* in Sweden and the United States measure 30·1$\pm$3·8 by 14·3$\pm$1·4 μ, the European material being partly smooth and partly verrucose and the American definitely verrucose. The light brown, long, very slender, verrucose teleutospores of *P. campanulae scheuchzeri* n.sp. in Switzerland (27 to 44 by 9 to 19 μ, average 35·5$\pm$2·0 by 13·7$\pm$1·4 μ) are a striking feature of this species. The teleutospores of *P. novae zembliae* Jørstad on *C. uniflora* in Greenland measure 35·9$\pm$2·2 by 19·4$\pm$1·7 μ.

Palm (B. T.). **Några parasitsvampar från södra Sverige.** [Some parasitic fungi from southern Sweden.]—*Bot. Notiser, 1935*, 5, pp. 412–416, 1935.

The following are among the 84 parasitic fungi collected by the writer in southern Sweden in 1933 and 1934: *Peronospora pratensis* Syd. on *Trifolium medium*, *P. spinaciae* on spinach [*R.A.M.*, xiii, p. 266], *Taphrina cerasi* on cherry (*Prunus cerasus* and *P. avium*) [ibid., xiii, pp. 544, 706], *T. insititiae* on plums [ibid., xi, p. 424] (especially of the Johannes variety in Halland and Scania), *Gymnosporangium clavariaeforme* on *Crataegus oxyacantha* [ibid., ix, p. 754], and *Puccinia porri* on leeks [ibid., xiv, p. 735].

Stanley (W. M.). **Chemical studies on the virus of Tobacco mosaic. IV. Some effects of different chemical agents on infectivity.**—*Phytopathology*, xxv, 10, pp. 899–921, 1935.

Of various chemicals tested for their action on the infectivity of purified preparations of the tobacco mosaic virus [*R.A.M.*, xiv, p. 659], 17 caused an increase and 46 a decrease of virulence, while 41 exercised

no significant effect [cf. ibid., xiv, p. 722]. The stimulatory influence of the first group, including dipotassium phosphate, sodium thiosulphate, phenolphthalein, pyridine, benzidine, l-menthol, and sulphur (all at 1 per cent.), is tentatively attributed either to their lowering of the hydrogen-ion concentration or (in the case of the three last-named) to their action as suspended particles. Three factors may be involved in the depressive effect, as gauged by the number of lesions arising from inoculation on *Nicotiana glutinosa* and *Phaseolus vulgaris* leaves, on the virus of the reagents comprising the second group, viz., oxidization induced, for instance, by 3 per cent. hydrogen peroxide, chloramine-T, potassium permanganate, potassium dichromate, iodine+potassium iodide (all at 1 per cent.), and saturated bromine; protein precipitation effected, e.g., by mercuric acetate, mercuric chloride, silver nitrate, lead acetate (all at 1 per cent.), and safranin (0·1 per cent.); and shifting the hydrogen-ion concentration to a point (exceeding P_H 10 or less than 3) injurious either to the virus [ibid., xv, p. 41], test plant, or both, a function, for example, of bromine and 1 per cent. diisoamylamine, ferric chloride, oxalic acid, picric acid, stannic chloride, and platinic chloride. The only chemical diminishing the virulence of the virus independently of these factors was 1 per cent. brucine.

The fact that the virus remained unaffected for lengthy periods by germicidal concentrations of mercuric chloride is considered to exclude it from the ranks of bacterial organisms. In purified preparations it was much more extensively affected by mercuric chloride at P_H 6, 7, and 8 than at 3, 4, and 5—results deemed to accord with recent evidence that the virus is a protein [ibid., xiv, pp. 260, 721].

As indicated above, dipotassium phosphate or phosphate buffers near P_H 7 markedly increase the infectivity of the tobacco mosaic virus towards *P. vulgaris*, whereas in the case of Turkish tobacco the effect may be reversed and in *N. glutinosa* the degree of virulence may be increased, decreased, or remain unchanged. The effect of charcoal on the infectivity of the virus was found to vary with the relative proportions of virus and charcoal in the inoculum. The virus was completely removable from the solution by adsorption with very finely divided charcoal at P_H 3 to 5.

STANLEY (W. M.). **Chemical studies on the virus of Tobacco mosaic. V. Determination of optimum hydrogen-ion concentrations for purification by precipitation with lead acetate.**—*Phytopathology*, xxv, 10, pp. 922–930, 1935.

The optimum hydrogen-ion concentrations for carrying out the three principal steps in the lead acetate process for tobacco mosaic virus [see preceding abstract] purification proposed by Vinson and Petre [*R.A.M.*, x, p. 761] have been determined as approximately P_H 9 for the lead subacetate precipitation, P_H 5·5 for the neutral lead acetate precipitation, and P_H 7 for the elution of the virus from the neutral lead acetate precipitate. A greatly increased virus yield was found to be obtainable by effecting the lead subacetate precipitation at P_H 9 instead of 6·5 as originally recommended. The modified process proved very useful in the rapid preparation of colourless, semi-purified solutions with a

virus concentration equal to, or somewhat exceeding, that of the starting material.

THORNBERRY (H. H.). **Effect of tannic acid on the infectivity of Tobacco-mosaic virus.**—*Phytopathology*, xxv, 10, pp. 931–937, 1935.

Tobacco mosaic virus [see preceding abstracts] at a 1×10^{-2} dilution in 0·1 molar phosphate buffers at reactions of P_H 10, 8·5, 7, 4·5, and 3 was treated with tannic acid at concentrations of 0·01 to 1 per cent. for periods of one minute to 20 days, at the end of which the infectivity of the virus was measured by the number of lesions developing on Scotia bean [*Phaseolus vulgaris*] leaves inoculated by rubbing with the suspension. The activity of the virus was found to be inhibited by a 1 per cent. solution of tannic acid in one hour in an alkaline medium and in 15 minutes in an acid one. The results of tests in which bean plants were inoculated with non-buffered virus at various dilutions indicated that infectivity, irrespective of virus concentration, was inhibited in 15 minutes at room temperature by 1 per cent. tannic acid, while in solutions of lower acid concentrations the activity of the virus, after an hour's exposure, was inversely proportional to the strength of the acid; after 5 to 20 days' exposure to a 0·5 per cent. solution the virus was non-infectious.

Partial restoration (up to 90 per cent.) of the infectivity of the virus was effected by ultrafiltration through collodion membranes (28·96 $\mu\mu$ pore diameter) retaining the virus but not the acid. Fifteen days' standing in 10 per cent. tannic acid did not permanently inactivate the virus. Another method of restoring activity consisted in precipitating the acid with gelatine, 1 per cent. of which caused the recovery of 24 to 64 per cent. infectivity in 5 to 60 minutes.

Applied to the host before inoculation, tannic acid in concentrations of 0·01 to 10 per cent. greatly reduced but in no case entirely prevented infection by the virus, the degree of inhibition being proportional to the concentration. Only a slight reduction in the virulence of the symptoms was effected by the application to the plants of tannic acid at the rates indicated above after inoculation with the tobacco mosaic virus.

KOCH (L. W.). **Recent investigations on Tobacco root rot in Canada.**—*Canad. J. Res.*, xiii, 3, pp. 174–186, 3 pl., 1 fig., 1935.

After referring to the economic importance of root rot of tobacco in the province of Quebec, the author gives a concise account of the results so far obtained in an investigation of the black rot (*Thielaviopsis basicola*) [*R.A.M.*, xiv, p. 403] problem, started in 1934. Direct microscopic examination of approximately 1,600 black-rotted tobacco roots growing under varying conditions in the seed-bed and in the field revealed the presence of several organisms, occurring singly, in various combinations with one another, or more especially, in frequent association with *T. basicola*. The fungi observed comprised the Phycomycetous 'mycorrhizal' fungus, representatives of the genus *Rhizoctonia*, including *R.* [*Corticium*] *solani*, as well as several forms of the type that occurs in orchids [ibid., xv, p. 108], *Asterocystis* (?) *radicis* [ibid., xiv, p. 362], and different species of *Pythium*. A brief description is given

of the development inside tobacco roots of the Phycomycetous endophyte which, in many respects, resembles that occurring almost universally in strawberry roots [ibid., xiii, p. 785]; daily examination of tobacco seedlings growing in soil infected with the fungus showed that 30 per cent. of the seedlings contained it in their roots five days after germination and that all were infected after ten days. The fungus was also found in mosses and liverworts (*Marchantia* sp.) [cf. ibid., xii, p. 235] growing in soil obtained from tobacco seed-beds.

Isolations from 206 typically diseased tobacco roots consistently yielded, apart from bacteria and nematodes, representatives of 21 genera of fungi [which are listed], in addition to *T. basicola*. The fungi most frequently isolated in association with the latter comprised 10 forms of *Pythium*, 7 of *Fusarium*, and 7 of *Rhizoctonia*. Of these, one form of *Rhizoctonia* of the *solani* type, three endophytes of the same genus, four forms of *Pythium*, and *T. basicola* were shown in preliminary inoculation experiments to be capable of attacking tobacco roots; the remainder, as well as the few species of Fungi Imperfecti which were isolated, showed no evidence of being parasitic on tobacco roots under the same experimental conditions.

BEACH (W. S.). **Control of Tobacco wildfire. Second report.**—*Bull. Pa agric. Exp. Sta.* 322, 29 pp., 5 figs., 1935.

After pointing out that control methods based upon the maintenance of clean seed-beds have not prevented the development of wildfire (*Bacterium tabacum*) [see above, p. 138] in the Pennsylvanian tobacco fields, the author gives a full account of a comprehensive series of experiments made on the control of the disease. The reddish-brown, zonate spotting locally known as 'rust' that occurs after rainstorms is stated to be merely a manifestation of wildfire in which the characteristic yellow halo is lacking.

While failure to secure satisfactory control is often due to faulty seed-bed practices, four years' experiments on isolated field plots showed that the bacteria that overwinter in the field (chiefly in incompletely decayed parts of the plants) are an important source of infection. The disease survives at least one complete year in the field, and not more than two years in any form of storage. No evidence was obtained that the soil harbours the organism if the plant decays completely, and no plant was found to act as host for the bacterium in the absence of tobacco from the field, though *Physalis virginiana* was attacked when growing in proximity to the crop. Repeated experiments likewise failed to demonstrate that the tobacco flea beetle [*Epitrix parvula*] or the potato flea beetle [*E. cucumeris*] disseminate the disease.

Infection was found to be much reduced when tobacco is grown under shade cloth, largely owing to decreased rain-splashing and soaking of the leaves.

Emphasis is laid upon the importance of applying fungicides to the seed-beds early; complete prevention of the disease in contaminated beds is possible when the fungicides are applied at seed time or at the seed-leaf stage. Bordeaux mixture and copper-lime dust may safely be applied at seed time. Loss of stand, which results only when the seed has been sprouted in bulk, may be obviated by heavier sowing.

A spray of calomel [mercurous chloride] and milk powder (3 to 1 by weight) mixed with water prevents seed-bed infection as effectively as Bordeaux mixture, though calomel, by preventing the development of secondary roots near the soil surface, may cause stunting or delay maturity.

The danger of infection that results from the overwintering of the organism may be overcome by field sanitation and cultural practices designed to hasten the decay of tobacco refuse, while the usual four-year tobacco rotation assists control. Autumn ploughing may prevent the spread of the disease on sucker growth in autumn and the carriage by flowing surface water of infected refuse into clean fields.

The amount of wildfire originating in seed-beds and field sources, respectively, varies greatly from year to year, but as a rule the seed-beds are much the more important source of infection; in years of average rainfall severe losses are limited almost entirely to seed-bed infections. Very wet years increase the importance of the overwintering that takes place in the field and lead to the contamination of land on which tobacco is not being grown. Success in combating the disease requires a high degree of co-operation by the growers in the measures adopted, detailed recommendations for which are given based on the experimental evidence presented.

Davidson (H. F.). **Bacterial wilt of Solanaceous crops.**—*Trop. Agriculturist*, lxxxv, 4, pp. 257–259, 1935.

In this brief, popular account of the symptoms and control of bacterial wilt of Solanaceous crops (*Bacterium solanacearum*) the author states that in Ceylon the susceptible hosts commonly cultivated include tobacco, tomato, eggplant, and chilli [*Capsicum annuum* : *R.A.M.*, xii, p. 77; xiii, p. 79]. Locally, the disease appears to be more severe on alkaline than on acid soils. Observations showed that the Porto Rican eggplant varieties Camuy and Long Green were highly resistant [ibid., xi, p. 29], the most resistant potato variety was Red Bliss Triumph, while on chilli pepper the least infection developed on the Chinese Giant, World Beater, Bull Nose, and Bolivian varieties.

The control measures recommended [cf. ibid., xiv, p. 658] include the selection of planting land never before sown to any susceptible host, the avoidance of alkaline fertilizers and excessive applications of lime and ash, the use of clean or disinfected seed, transplanting only when strictly necessary, and then when the plants are quite young, careful watering, removal of diseased material, plant débris, and susceptible weeds, and the practice of crop rotation. Susceptible weeds should not be allowed to grow on fallow land intended for Solanaceous crops.

Smith (K. M.). **New virus diseases of the Tomato.**—*J. R. hort. Soc.*, lx, 10, pp. 448–451, 7 pl., 1935.

A description is given of three new virus diseases of the tomato which were identified in 1935 from material sent in from different parts of Great Britain, namely, a disease which was first observed in a commercial glasshouse in Somersetshire [*R.A.M.*, xiv, p. 724], and has been since recorded from several other localities, including

Belfast. In addition to symptoms already noticed the trouble is characterized by an almost complete cessation of growth. Under certain environmental conditions the diseased plants may assume a bushy or rosetted habit with malformed shoots and leaves. Ripe fruit exhibits a mottling or blotching of pale spots and ring-like marks on a darker background, while green fruit is apparently normal but of very poor quality.

The outstanding feature of the second disease, which occurred in the west of Scotland and at Cheshunt, is the extreme malformation of affected plants; in one type, the leaf blade is completely suppressed, so that the leaves often consist only of long, thin threads; in another, a large number of very small, closely packed leaflets, ending in a cork-screw tendril, gives the diseased plant a curious 'fern-leaf' [cf. ibid., xiv, p. 218] appearance; the apices of the leaflet teeth of individual leaves may be very considerably prolonged, producing a spidery effect, and enations and small additional leaves may be developed on the under side of the leaves. Diseased plants also show a tendency to excessive growth, so that under commercial conditions of cultivation they may present a striking appearance of leafiness and overgrowth; this is usually accompanied by a certain amount of dark and light green mottling on the leaves. This disease was commonly observed by the author on tobacco during a tour of the tobacco-growing districts of south-west France in 1934. The trouble is a very serious one for tomato growers, owing to the paucity and very poor quality of the fruits produced, and also to its infectious nature.

The third disease was reported from Ipswich, Felixstowe, and Bath, where it is widespread and serious. The symptoms are mainly of the mosaic type, but the mottling is different from that in all the other known mosaic diseases of the tomato. Young affected plants are of an abnormal green colour, with a faint greyish cast, and the leaves are banded with pale yellow and dark green. In older plants the chief symptom is the extreme yellowing of the lower parts of the plant, simulating nitrogen starvation. The ripe fruits are mottled with spots of yellow and pale green. Various tests on a range of host plants showed that this disease is due to a different virus from those causing the other two diseases.

A brief discussion is also given of the possible origin of these diseases, and the paper terminates with some recommendations of possible measures for their control.

Van Schreven (D. A.). **Virusziekten van de Tomaat.** [Virus diseases of the Tomato.]—*Tijdschr. PlZiekt.*, xli, 10, pp. 261–300, 4 pl., 1935.

The only virus diseases of tomato definitely known to occur in Holland are stated to be ordinary mosaic (tobacco virus 1), some obscure forms of streak [*R.A.M.*, xv, p. 122] observed only once, and the so-called 'Huissen' disease, named after the locality of its origin. An attempt is here made to summarize from contemporary literature the outstanding points of recent investigations on the following disorders: ordinary mosaic, aucuba mosaic (tobacco virus 6) [see above, pp. 168, 178], spotted wilt [ibid., xv, p. 65 and next abstract], mixed

virus streak, glasshouse streak (tomato streak virus 1) [ibid., xv, p. 122], all found in Europe, stem necrosis streak (tobacco virus 9), ring mosaic streak (America) [ibid., xiv, p. 261], big bud (Australia) [ibid., xiv, p. 131], and bunchy top (South Africa) [ibid., xv, p. 124]. Mention is further briefly made of yellows or curly top [ibid., xv, p. 123] (United States), 'stolbur' or woodiness (Crimea), and narrow leaf [ibid., xiv, p. 262].

The Huissen disease, which affected a few Ailsa Craig tomatoes both in 1933 and 1934, is characterized by sharply delimited, bronze-coloured areas following the leaf veins and occasionally assuming the shape of rings, asymmetrical development of the leaves with curling of the margins, production of lateral shoots to replace the necrotic tops, premature death of the buds and flowers, and a few circular lesions on the fruits, less distinctly defined than those of the possibly related spotted wilt. In 1934 five plants each of Ailsa Craig tomato, White Burley tobacco, and Spanish pepper [*Capsicum annuum*] were inoculated with undiluted sap from two tomato plants infected by grafting in the previous year. All the tobacco plants developed the typical Huissen disease symptoms, and all the peppers ceased growth three weeks after inoculation. Only one out of the five tomato plants, however, showed the above-mentioned bronze discolorations, the remainder (as well as the peppers) contracting the symptoms of ordinary tobacco mosaic, which was evidently one of the components of the inoculum and predominated in the transmission tests.

A five-page bibliography is appended.

McWhorter (F. P.) & Milbrath (J. A.). **The interpretation of Oregon tip blight on a basis of causal viruses.**—Abs. in *Phytopathology*, xxv, 9, pp. 897–898, 1935.

Since 1930 a tomato disease locally known as 'tip blight' is stated to have been of great economic importance in the southern Oregon canning areas. The most noticeable symptom is severe blighting of the terminal shoot, which kills young plants and rapidly inhibits the production of marketable fruit by older ones. Two viruses, namely, that of spotted wilt [see preceding abstract] and an undetermined one, appear from inoculation tests to be implicated in the causation of tip blight. The undetermined virus is very difficult to transfer from tomato to tomato, and has so far failed to produce symptoms on any other Solanaceous host. On tomato it is highly destructive, being selectively active on the terminal shoots and first manifested by necrotic, black lesions on the leaves.

Arnaud (G.) & Barthelet (J.). **Maladies des arbres d'ornement.**—[Diseases of ornamental trees.]—*Rev. Path. vég.*, xxii, 4, pp. 245–250, 2 pl., 1935.

The results of experiments in 1935 at Versailles, in which approximately three-year-old nursery plants of a number of ornamental trees were inoculated through wounds in the trunk with pure cultures of *Fusicoccum cedrelae* isolated from *Cedrela sinensis* [*R.A.M.*, xiii, p. 479], showed that *Robinia pseud-acacia*, as well as the *monophylla* form of this species, are highly susceptible to the fungus, since the lesions

which developed on them within five or six weeks were much more extensive and penetrated more deeply into the wood than on *C. sinensis*. While not yet conclusive, this result is considered to add weight to the suggestion made by the authors in their previous communication [loc. cit.] that the *Cedrela* fungus may be identical with the *Phomopsis* stage of *Diaporthe oncostoma*. The question of the pathogenicity of the fungus to the other tree species tested is reserved for future discussion.

In parallel experiments with *Verticillium dahliae* from *Ailanthus glandulosa* [ibid., xi, pp. 95, 550, and cf. also p. 755] well-defined lesions developed within five or six weeks on *A. glandulosa* and *Koelreuteria paniculata*, the results on the other species tested being so far indefinite, while the inoculation wounds on *R. pseud-acacia* were apparently entirely healed without any trace of infection.

Stapp (C.) & Bortels (H.). **Mikrobiologische Untersuchungen über die Zersetzung von Waldstreu. II. Mitteilung.** [Microbiological studies on the decomposition of the forest cover. Note II.]—*Zbl. Bakt.*, Abt. 2, xciii, 1–4, pp. 45–56, 1935.

All the tannin-decomposing fungi isolated from the cover and soil of conifer and beech forests in different parts of Germany were found to belong to the genera *Aspergillus* and *Penicillium*, ten species belonging to the *Citromyces* section of the latter, e.g., *P. thomii*, and *A. niger* being particularly active in this respect. Diagnoses are given in German of these ten species, five of which are considered to be new to science. *A. niger* was extensively represented in the very fertile, calcareous beech and spruce forest soils in the neighbourhood of Göttingen.

Inland-Rundschau. Bremen. [Inland review. Bremen.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 42, p. 520, 1935.

The dying-off of elms from graphiosis [*Ceratostomella ulmi*] at Bremen is stated to be proceeding continuously, notwithstanding the scrupulous observance of measures for the protection of the remaining healthy trees [*R.A.M.*, x, p. 752]. Five to seven years ago some vigorous young elms were interplanted with the severely infected old stands, and so far adequate resistance has been shown by *Ulmus montana fastigiata*, *U. vegeta*, and *U. superba* (*praestans*). Two individuals of *U. sarniensis* (*wheatleyi*), hitherto sound, had to be cut down on account of infection during 1935. A planting of *U. vegeta*, dating from 1898, is still healthy, while a few diseased *U. pittieriana* trees interspersed among the stand have been removed. Some 30-year-old specimens of *U. umbraculifera* in a neighbouring village are still healthy whereas the adjoining stands of *U. campestris* have had to be felled [ibid., xv, p. 126 and next abstract].

Noell. **Nochmals Ulmenkrankheit.** [Elm disease again.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 48, pp. 590–591, 1935.

At Crefeld [Rhine], where the dying-off of elms from graphiosis [*Ceratostomella ulmi*: see preceding abstract] was first observed, there were 2,979 elms in the streets at the onset of the disease, which has since attacked 2,315 of the total number. Eight and ten years ago

several streets were replanted with elms, which were also grown for experimental purposes in the municipal nursery. The varieties used were *Ulmus montana* and its vars. *fastigiata* and *umbraculifera*, *U. sarniensis*, and *U. vegeta*. To-day practically nothing but stumps are left in consequence of infection, a fair degree of resistance to which was shown at the outset by *U. montana fastigiata*.

Dodge (B. O.). **The situation regarding Dutch Elm-disease, the Japanese beetle, and the gypsy moth at the Botanical Garden.**—*J. N.Y. bot. Gdn*, xxxvi, pp. 247–252, 1935.

In this note on the progress of the Dutch elm disease [*Ceratostomella ulmi*: *R.A.M.*, xv, p. 130] eradication campaign in New York State the author points out that every elm in the region covered by the official survey (about 150 sq. miles), is inspected once a month during the summer. Reports on suspected material are issued within a week and affected trees are destroyed within three weeks. So complete is the public co-operation in the campaign that not one legal action has arisen in work involving the destruction of thousands of trees. Two or three more years must elapse before it can be known with certainty whether the measures taken will eventually prove successful.

D'Oliveira (B.). **Phytopathological notes.**—*Rev. agron.*, xxiii, 1, pp. 50–51, 1935.

The effect of tannic acid on the growth of orange rust (*Endothiella gyrosa* or the pycnidial form of *Endothia fluens*) [*R.A.M.*, xi, p. 611], which infects the cork layer of the cork oak [*Quercus suber*] in Portugal, was tested on a synthetic medium containing 0·1, 0·5, 1, 2·5, and 5 per cent. tannic acid (Merck). The average dry weights of the resulting cultures were 0·679, 0·566, 0·443, 0·250, and 0 gm., respectively. The fungus in this medium is acidogenic in contrast to the alkalizing tendency of *Fusicladium dendriticum* [*Venturia inaequalis*], *F. pirinum* [*V. pirina*], and *F.* [*dendriticum* var.] *eriobotryae* [ibid., xiv, p. 777] on a substratum of almost the same composition. These organisms made no development in the presence of 0·5 per cent. tannic acid at P_H 3·22 but all grew at 0·01 per cent., and at P_H 3·18 with 0·05 per cent. malic acid.

Laubert (R.). **Eine Schwarzfleckenkrankheit des Ahorns.** [A black spot disease of the Maple.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 42, pp. 514–515, 1 fig., 1935.

A note is given on the black spot of maples, hitherto known with certainty only from the Sudetic Alps and from Denmark, caused by *Euryachora rhytismoides* [*R.A.M.*, viii, p. 274], the macroscopic and microscopic differences between which and the widespread *Rhytisma acerinum* [ibid., xiii, p. 280] are briefly indicated.

Priehäusser (G.). **Beitrag zur Frage der Entstehung der Fichtenrotfäule.** [A contribution to the problem of the development of red rot of Spruce.]—*Forstwiss. Zbl.*, lvii, 20, pp. 649–655, 1935.

The extreme liability of spruce stands in the East Zwiesel silvicultural district of the Bavarian Forest to red rot [*Fomes annosus*: *R.A.M.*,

xiii, p. 137; xv, p. 68] is explained by the writer on an ecological and microbiological basis.

Under local conditions the tree is of the shallow-rooting type, unable to penetrate through the thick humus to the mineral strata of the soil and largely dependent, therefore, on the aid of fungal symbionts for its nutrition from the soil cover, mainly consisting near the fringes and in the eastern portions of the stands of xerophile mosses, e.g., *Hylocomium splendens* and *Dicranum scoparium*, in which the mycorrhiza are unable to develop, with the result that the spruce roots die off and rot. Towards the interior moister conditions are signalized by the copious growth of *Sphagnum acutifolium* and *Polytrichum formosum*, in the presence of which the mycorrhiza make satisfactory growth and the tree roots remain healthy. A sure sign of microbiological activity in the soil cover is the abundant development of a *Marasmius* occurring on spruce needles. The accumulation of heavy, acid humus leads to deterioration, or at any rate to thickening and acidification, of the soil, and as the trees grow older there is an increasing tendency to desiccation of the upper soil layers; mycorrhizal activity is reduced, the vitality of the trees is impaired, and red rot ultimately finds its way into the trunk.

The possibility of transforming the local pure spruce stands into mixed spruce, fir, and beech woods—the natural type for these particular soil conditions—is briefly considered.

ROBERTSON (W. A.). **Report of the Director of Forest Products Research for the year 1934.**—*Rep. For. Prod. Res. Bd, Lond., 1934*, pp. 3–52, 2 pl., 1 fig., 1 diag., 2 graphs, 1935.

In 1934, a test was made at the Forest Products Research Laboratory, Princes Risborough, to determine the effect of *Ceratostomella coerulea* [or *Ophiostoma coeruleum*: *R.A.M.*, xiv, p. 274] on the strength of the sapwood of Scots pine [*Pinus sylvestris*]. After about six months' incubation, though no reduction in strength under gradually applied bending loads was apparent, there was a reduction of about 20 per cent. in the strength when the loads were applied suddenly, together with a reduction of about 10 per cent. in hardness on the side grain. The experiment could not be continued longer than six months as the test pieces became contaminated with moulds.

An investigation of the effect of *Polyporus hispidus* [ibid., xiii, p. 666] on the strength of ash showed that the fungus reduces the strength and stiffness in static bending at approximately uniform rates, the reductions amounting to 36 and 15 per cent., respectively, after 36 weeks' incubation. The maximum crushing strength was reduced by about 13 per cent. in 24 weeks. The strength under suddenly applied bending loads, i.e., 'toughness', was reduced by about 20 per cent. after two weeks, before any discoloration or disintegration had become apparent; the reduction reached 40 per cent. after 4 weeks' and 90 per cent. after about 15 weeks' incubation, respectively.

As the creosoted railway sleeper made of Baltic fir [*Picea excelsa*] that is used in England has an average life of only 18 to 25 years on a main line [cf. ibid., xiv, p. 545], an investigation was begun of the suitability for railway sleepers of certain species of timber grown in

the British Isles and of the possibility of reducing the cost of treating the sleepers while maintaining or extending their life.

The exceptionally dry conditions prevailing during the summer of 1934 were unfavourable for the development of dry rot [*Merulius lacrymans*: ibid., xiv, p. 136] in the experimentally constructed house, and owing to a general drying-out of the sub-soil, conditions became too dry for fungal growth, even in the badly constructed floors. The first experiment with various types of solid floors was concluded; the results obtained showed that the only satisfactory type of solid floor is one that includes some effective damp-proof course between the concrete and the boards, and that this is probably best provided by a thick layer of poured bitumen directly under the boards.

Further evidence showed that the fungus provisionally identified as *Fomes cryptarum* [loc. cit.] is fairly widely distributed and can cause serious decay under favourable circumstances; infected wood is very readily attacked by the death-watch beetle [*Xestobium rufovillosum*].

In an attempt to discover a suitable toxic agent that can be added to paint to prevent the growth of moulds [cf. ibid., xv, p. 40] tests are being made with a number of substances. The problem offers some difficulty, as the oil in the paint inactivates the greater part of any toxic substance added and many antiseptics are useless on account of their early evanescence or their effect on the setting of the paint film.

Experiments were also initiated on the control of sap-staining of timber by chemical treatment [ibid., xv, p. 69] and the efficacy of some thirty proprietary wood preservatives intended for surface application. Progress is also reported in the identification and physiology of wood-destroying fungi. Rudge's views on the chemical decay of timber [ibid., xiv, p. 543; xv, p. 131] are criticized and it is pointed out that fungi have repeatedly been shown to be capable of attacking wood *per se* under suitable conditions.

Bryan (J.) & Richardson (N. A.). **Experiments on the preservation of mine timber. Progress report No. 1.**—*For. Prod. Res. Rec., Lond.*, 3, 10 pp., 3 pl., 2 graphs, 1935.

Although timber to the value of some £6,000,000 is used annually in the mines of the United Kingdom, it is estimated that less than 2 per cent. is given any preservative treatment. The experiments herein described were undertaken at two pits, one near Nottingham (Pinxton Collieries) and the other at Portobello, Edinburgh (Niddrie and Benhar Coal Co.), to demonstrate the economy and advantages of preservative treatment applied to mine timber.

Fungi were prevalent in both pits, chiefly *Merulius lacrymans* and *Poria vaporaria*, other species represented including *Coniophora cerebella* [*C. puteana*], *Paxillus panuoides, Fomes annosus, Polystictus versicolor* [*R.A.M.*, xiv, p. 413], and *Lentinus lepideus*. Both the hot and cold open-tank impregnation processes were used, the Scots pine [*Pinus sylvestris*] props being immersed in the preservatives (sodium chloride 10, 8, 5, and 3·5 per cent., zinc chloride 5 and 2, sodium fluoride 4 and 2, and Wolman salts or triolith [ibid., xii, p. 262], consisting of 80 per cent. sodium fluoride, 6 per cent. dinitrophenol, 5 per cent. sodium dinitrophenate, and 8 per cent. potassium dichromate)

for a period of $1\frac{1}{2}$ to $1\frac{3}{4}$ hours at 180° F. Creosote of the coke oven type was also used at Nottingham.

The experiments are still in the early stages and the results to date do not therefore permit of definite conclusions as to the respective merits of the treatments, but it is evident that the best protection is so far being secured with the more expensive preservatives, triolith (£70 per ton) and sodium fluoride (£50 per ton). Even sodium chloride (£4 per ton), however, doubles the life of the timber at a conservative estimate. In the case of the dearer preservatives, a 2 per cent. solution would seem to be sufficiently concentrated, in which case the treatment of a 6 ft. prop with triolith would amount to less than 3*d.*, inclusive of labour.

RABANUS (A.). **Augenblicklicher Stand der Holzschutztechnik.** [The position at the present moment of the timber protection technique.] —*Chemikerztg*, lix, 79, pp. 801–803, 1935.

The present situation of the timber impregnation industry in Germany is reviewed, with notes on the various treatments in current use (of which coal-tar is stated to be still the most popular) and on certain improvements designed to increase their utility. Most of the work referred to has been noticed from time to time [*R.A.M.*, xiii, p. 667 *et passim*].

WALKER (J. C.). **Diseases of vegetable crops.**—65 pp., Ann Arbor, Michigan, Edwards Brothers, Inc., 1935. [Mimeographed.]

In this work, intended to serve as a reference text for an advanced course in vegetable pathology, the author succinctly outlines the most important facts concerning the major diseases of 19 vegetable crops, the notes being arranged generally under the following headings: hosts, history, occurrence, economic importance, symptoms, causal organism and its life history, pathological histology, environmental factors, varietal resistance, control, and bibliography. Some of the pertinent facts relating to the production of many of the crops are given and many minor diseases are listed.

CHUPP (C.) & PIRONE (P. P.). **Some notes on fungi causing diseases of Cabbage and other crucifers.**—*Plant Dis. Reptr*, xix, 17, p. 275, 1935. [Mimeographed.]

Chinese cabbage [*Brassica chinensis*] leaves received from Long Island in September, 1935, were found to be covered with a profusion of the circular to subcircular, pale tan to greyish spots characteristic of *Cercosporella albo-maculans* (Ell. & Ev.) Sacc. [*R.A.M.*, vii, p. 214]. The conidia were also identical with those of that organism, but the conidiophores were distinctly coloured like those of *Cercospora* [cf. ibid., xv, p. 59], this feature being also conspicuous in material collected on turnip in Mississippi in 1919. *C. albo-maculans* was transferred by Saccardo to *Cercosporella* because of its hyaline conidiophores, a characteristic borne out by the type material, but it would appear that the crucifer fungus resembles certain other species of *Cercospora*, e.g., *C. rosae* [ibid., ix, p. 37] and *C. pyri* Farlow in the indiscriminate

production of either coloured, hyaline, or partially tinted conidiophores.

An examination of the type material of the species described by Peck (*Rep. N.Y. St. Mus.*, xxxv, p. 140, 1884) as *C. lepidii* shows the fructifications to be those of *Macrosporium herculeum* [*Alternaria brassicae* (Berk.) Bolle: *R.A.M.*, xiv, p. 486]. The same applies to the specimen labelled by Sydow in 'Mycotheca Marchica' (3087) as *C. bizzozzeriana* Pass. on *Lepidium*.

Tompkins (C. M.), Tucker (C. M.), & Gardner (M. W.). **A Phytophthora root rot of Cauliflower.**—Abs. in *Phytopathology*, xxv, 9, pp. 893–894, 1935.

Winter plantings of cauliflower in the low-lying, poorly drained coastal areas of central California are stated to suffer from root rot (*Phytophthora megasperma*) [*R.A.M.*, xiii, pp. 25, 180], which induces reddening or purpling of the leaves, sudden wilting, and invasion and decay of the root system in plants of all ages. The incubation period of the fungus in seedlings in the open at 14° to 20° C. was about three weeks, and positive results were given by inoculation tests with the reisolated organism. On malt extract-agar the pathogen made the best growth at 19° to 22°. Natural infection occurs on Brussels sprouts, cabbage, and stock (*Matthiola incana*), the last-named and wallflower (*Cheiranthus cheiri*) also responding to artificial inoculation. The oogonia and oospores of the fungus are slightly smaller than those of *P. megasperma*, but the difference is regarded as too trifling to justify a separation. Both amphigynous and paragynous antheridia are formed, the latter predominating; the rare sporangia are non-papillate.

Ramsey (G. B.) **Peronospora in storage Cabbage.**—*Phytopathology*, xxv, 10, pp. 955–957, 1 fig., 1935.

Attention is drawn to the recent occurrence on 15 to 40 per cent. of the stored cabbages in a Wisconsin storehouse of an extensive greyish-black discoloration of the stems and heads due to *Peronospora parasitica*, recorded as the agent of a similar rot of cabbage in Holland [*R.A.M.*, v, p. 643; cf. also ibid., xiv, p. 546] and of turnips in the United States (*Phytopathology*, x, p. 321, 1920). In addition to the damage caused by the downy mildew itself, the affected cabbage tissues are very susceptible to secondary bacterial and fungal invasion, e.g., by *Alternaria* [ibid., xv, p. 70] and *Rhizopus*. Under Dutch conditions *P. parasitica* overwinters on plant débris in the field and it may possibly do so also in Wisconsin.

O'Brien (D. G.) & Dennis (R. W. G.). **Raan or boron deficiency in Swedes.**—*Scot. J. Agric.*, xviii, 4, pp. 326–334, 3 pl., 1935.

'Raan' is the name applied in Dumfriesshire and Galloway to a disorder of swedes occurring throughout the south-west of Scotland, which has been ascertained to be identical with that known in Canada as 'brown heart' [*R.A.M.*, xiv, pp. 70, 547, 669]. The symptoms of the disease are described in detail, and it is stated that the brown discoloration appears to be associated with a slight swelling of the middle lamella of the parenchymatous cell walls.

The feeding value of a raan-affected crop is considerably impaired, comparative analyses of healthy and diseased swedes having shown a decrease in the latter of 3 to 4 per cent. soluble carbohydrates and 12 per cent. sugar. All the purple-topped varieties are more or less susceptible to raan, with the possible exception of Garton's White-fleshed, while the relatively resistant Golden succumbed to the disease under adverse soil conditions induced by heavy liming. It was found that the resistant varieties have larger root systems, with a higher proportion of fibrous roots, than susceptible ones.

In water culture experiments the omission of manganese seriously affected the growth of turnip seedlings but did not induce symptoms of raan. The omission of boron from the culture solution, however, resulted in the development of the trouble, while the application of borax [see next abstract] to the soil at the rate of 20 lb. per acre caused a reduction of the disease from 70 and 40 per cent. in field experiments in Kirkcudbrightshire and Dumfriesshire, respectively, to nil. In order to obviate the risk of injury to the crop, farmers are advised not to apply borax at rates exceeding 20 lb. per acre and to mix this amount with a finely divided inert filler to raise the bulk to at least 1 cwt. per acre before use.

HØNNINGSTAD (A.). **'Vattersott' hos Kålrot skyldes bormangel.** ['Dropsy' in Swedes is due to boron deficiency.]—Ex. *Meld. Stat. Forsøksgård Forus 1934,* pp. H35–H38, 1935.

No parasitic agent having been detected in association with the so-called 'dropsy' of swedes in Norway, characterized by a more or less extensive yellow to dark, greyish-brown mottling of the inner root tissues, experiments have been conducted during the last three years to determine the influence of fertilizers on the course of the disorder. In 1934 boric acid was included in the trials at rates of 0·5 to 5 kg. per decare, with the result that even the smallest quantity gave practically complete, and the remainder absolute, control [cf. preceding abstract]. On the other hand, plots receiving ordinary fertilizers (especially potash) yielded only a small proportion (8 to 10 per cent.) of edible material. Borax, which is applied against heart and dry rot of beets [see next abstract], is easier to apply than boric acid, the former being soluble in cold water while the latter requires boiling water (6 to 8 l. per kg.); borax, however, contains about $\frac{1}{3}$ less boron than boric acid, so that $1\frac{1}{2}$ times as much must be used. The retail price of the latter at Stavanger is Kr. 0·75 [about 10*d.*], so that borax would have to be procurable at Kr. 0·50 to be commercially advantageous.

MEYER-HERMANN (K.). **Erfolgreiche Bekämpfung der Herz- und Trockenfäule der Rüben durch Borax!** [Successful control of heart and dry rot of Beets by borax!]—*Kranke Pflanze,* xii, 10, pp. 151–153, 1 pl., 1935.

Since 1932 extensive tests have been in progress at the Harleshausen Plant Protection Station, Kurhessen, in the control of heart and dry rot of beets by the application of borax at varying rates [*R.A.M.*, xv, p. 71], the areas covered in 1933, 1934, and 1935 being approximately 1,250, 2,500, and 5,000 acres, respectively. The so-called 'technical'

borax powder has proved uniformly more suitable for the object in view than the fine but readily coagulating pure borax or boric acid [cf. preceding abstracts]. The former has been applied at the rate of 5, 10, 15, 20, 25, 30, and 40 kg. per hect., after mixing four or five times with 1 doppelzentner [100 kg.] 40 per cent. potash. The best results, both as regards sugar content and dry weight, have generally been obtained with 15 or 20 kg., but the beneficial effects even of the minimum quantity were distinctly noticeable. The average increase of yield from the treatment amounted to between 50 and 100 doppelzentner beets per hect. [40 and 80 cwt. per acre] (280 dz. in one case) for an average outlay of only M. 4·50 to 6. Used at a rate in excess of 20 kg. borax tends to reduce the sugar content and to some extent the yield. The best time for application is the end of April or early May, followed by further treatments at the end of May and end of June. Bor-superphosphate and bor-am-sup-ka [ibid., xiv, p. 613] 6×8×12 (ready mixed) should be used at 3 and 6 doppelzentner, respectively, to correspond to 15 kg. borax (4 and 8 doppelzentner, respectively, for 20 kg.).

De Haan (K.). **Beschouwingen over de practische Suikerbietenteelt. V. Ziekten en vijanden van de Bieten en hun bestrijdingswijze.** [Observations on practical Sugar Beet cultivation. V. Diseases and pests of Beets and their control.]—*Meded. Inst. Suikerbiet., Bergen-o.-Z.*, 6, pp. 151–166, 1935.

Notes are given on the symptoms, etiology, and control of a number of diseases attacking beets in Holland. Seed disinfection against root rot (*Phoma betae*, *Pythium de Baryanum*, and *Aphanomyces levis*) [*R.A.M.*, xiv, p. 548] is stated to have become a matter of general routine. Good results are obtained by dusting with UT 685 at the rate of 8 gm. per kg., two hours' immersion in 0·5 per cent. germisan, and the short disinfection process with 2·5 l. of a 3 per cent. germisan solution for 20 kg. of seed. Great care should further be taken to prevent the incrustation of the soil, which impedes the rapid growth of the plants and so exposes them to infection; for this purpose sodium nitrate should be replaced by calcium nitrate or calcium ammonium nitrate. Thorough drainage is also essential.

Girth scab (*Oospora cretacea*) [*Actinomyces* spp.: ibid., xiii, p. 288; xiv, p. 548] appears about the middle of June, when the leafy crowns of the plants, broken off just above soil-level, may be blown through the fields by strong winds.

Excellent control of the very prevalent manganese deficiency disease [ibid., xiv, p. 549] is given by the treatment of the plants with manganese sulphate solution at a maximum concentration of 1·5 per cent., this method being considered preferable to strewing the substance along the rows at the rate of 15 kg. per hect. A repetition of the former treatment after about five weeks is necessary. It is estimated that a 4 to 5 per cent. increase of yield may be secured by these methods. The writer's work on the control of heart rot [see preceding abstract] by the use of borax has already been summarized [ibid., xiv, p. 733].

Considerable damage is caused to the seed beet crop, especially in northern Holland, by downy mildew (*Peronospora schachtii*) [ibid., xi,

p. 419; xiv, p. 548]. Diseased individuals should be immediately removed and Bordeaux mixture applied. The other diseases described are rust (*Uromyces betae*) [loc. cit.], yellowing, including the form due to *Verticillium* [ibid., xiv, p. 549], mosaic [loc. cit. and next abstract], leaf spot (*Cercospora beticola* [ibid., xiv, p. 813], violet root rot (*Rhizoctonia violacea*) [*Helicobasidium purpureum*: ibid., xiv, p. 548], crown gall (*Bacterium tumefaciens*) [see above p. 133], *Bacillus betae* [ibid., v, p. 208], and the storage of rot caused by *Sclerotinia libertiana* [*S. sclerotiorum*: ibid., xi, p. 489].

ADAM (D. B.) & PUGSLEY (A. T.). **A yellow bacterium associated with 'halo blight' of Beans.**—*Aust. J. exp. Biol. med. Sci.*, xiii, 3, pp. 157–164, 1 fig., 1935.

A yellow bacterium consisting of motile, Gram-negative rods, 0·8 by 0·5 μ, growing rapidly on beef extract-agar and other standard media, liquefying gelatine, fermenting glucose and saccharose with acid but no gas formation, and reducing nitrates, has been found commonly associated with the lesions of halo blight (*Phytomonas* [*Bacterium*] *medicaginis phaseolicola*) [*R.A.M.*, xiv, p. 733], which is stated to be much the most destructive and widespread disease of French beans (*Phaseolus vulgaris*) in Victoria. By closely following the pathogen the yellow bacterium may become systemically distributed within the host and modify the symptoms of the disease. Thus, if the yellow bacterium is mixed with *Bact. medicaginis phaseolicola* at the time of inoculation, the blight symptoms are retarded and their severity mitigated. A similar organism was isolated from mulberry (*Morus rubra*) blight (*P.* [*Bact.*] *mori*) [ibid., xiii, p. 748] lesions which, on simultaneous inoculation with *Bact. medicaginis phaseolicola* into beans, produced the same modifications as the yellow bacterium from halo blight spots. It has also been found occasionally in lesions on gladiolus, stock [*Matthiola incana*], oleander, and soy-bean.

SEVERIN (H. H. P.) & FREITAG (J. H.). **California Celery mosaic diseases.**—Abs. in *Phytopathology*, xxv, 9, p. 891, 1935.

Western celery mosaic and celery calico are the common names proposed for two celery mosaic diseases with different symptoms and host ranges in California. The features of western celery mosaic resemble those of southern celery mosaic (celery virus 1) [*R.A.M.*, xiv, p. 615] but the viruses differ in host range, while calico is readily distinguishable in the field by the green and amber mottling of the outer foliage, rarely affecting the younger leaves. Five of the ten species of aphids transmitting the two diseases are known to breed on celery under natural conditions. The melon aphid, *Aphis gossypii*, conveys both by contamination of mouth parts; each virus was transmitted by single, previously non-infective aphids of this species after five minutes' feeding on diseased, and the same period on healthy, plants. An undetermined aphid transmitted the western celery mosaic virus in four to seven hours. Large populations of different species of aphids reared on western celery mosaic plants and transferred daily to healthy individuals transmitted the virus on the first day but not subsequently.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, vii, 9, pp. 176–177, 189–200, 1935.

GERMANY (PRUSSIA. PROVINCE OF SAXONY). In accordance with an Order coming into force on 31st August, 1935, and ceasing to operate on 31st December, 1940, all one- two-, and three-year-old asparagus plantings in the Osterburg administrative district of Saxony must be inspected between the beginning and 23rd June for the presence of asparagus rust [*Puccinia asparagi*: *R.A.M.*, xiv, p. 811] and the diseased portions, together with volunteer plants in fields, ditches, railway embankments, and the like, cut out and burnt or deeply buried by the latter date at latest. A copper-lime preparation prescribed by the Plant Protection Service must be applied three times at three- to four-weekly intervals to all plantings that have not reached the cutting stage, the date of commencement to be annually announced in the official journal.

JUGO-SLAVIA. By a Decree of the Ministry of Agriculture of 19th August, 1935, potatoes imported into Jugo-Slavia must be accompanied by a certificate stating that the produce is free from wart disease (*Synchytrium endobioticum*) [ibid., xi, p. 272] and originates in an area surrounded by a protective zone of 10 km. from which the fungus is also absent. This restriction does not apply to new potatoes from countries not infested by wart disease, which may be sent without a certificate up to 31st May in any year. The charge for official inspection by phytopathological experts of potato consignments entering the country is 2 dinar [about $1\frac{3}{4}$*d.*] per sack of 100 kg.

A Decree of the same date regulates the commerce in plant protectives in Jugo-Slavia. Only the manufacture, importation, and sale of substances approved by the Ministry of Agriculture is permitted and this approval is given only on the results of chemical and biological tests of the preparations, except that the sale of copper sulphate (98 per cent. purity), ground sulphur (60° Chancel), ventilated sulphur (80° Chancel), stick sulphur, and iron sulphate (98·5 per cent. purity) is permitted without special sanction. Requests for the testing of any substance must be accompanied by the following information: (*a*) the name of the preparation, (*b*) the name of the manufacturer, (*c*) its quantitative composition, (*d*) its physical properties, e.g., fineness, stability of emulsion, (*e*) a list of diseases or pests, with their hosts, against which it is intended for use, and (*f*) directions for use. The requisite quantity of material for testing must be supplied free of cost. The tests, both analytical and biological, are carried out at two Government institutions and must be completed within 3 years from the date of application. Persons requesting tests must pay all expenses as regulated by the Ministry. The results of the tests are communicated to the Ministry of Agriculture which then issues or withholds the approval required. All preparations allowed to be sold must bear labels indicating the name and manufacturer, the chemical character of the product, viz., whether mercurial, arsenical, and the like, whether poisonous or not, the net weight, the date of approval, and other information supplied when the request for testing was made.

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XV APRIL 1936

SCHMIDT (E. W.). **Bericht über neuere Arbeiten zur Biologie der Zuckerrübe.** [Report on recent investigations on the biology of the Sugar Beet.]—*Dtsch. Zuckerindustr.*, lx, 40, pp. 864–866; 42, pp. 901–902, 1935.

Some personal observations of the writer in connexion with a review of recent work on leaf spot (*Cercospora*) [*beticola*: *R.A.M.*, xv, p. 191], curly top [ibid., xiv, pp. 809, 813], and mosaic [ibid., xiv, p. 808] of beets are of interest. New hosts of *C. beticola* include *Chenopodium foetidum*, *C. quinoa*, *C. hybridum*, *C. vulvaria*, *C. ambrosioides*, and *C. amaranticolor* (all successfully inoculated in the field in 1935), besides another member of the Chenopodiaceae, *Hablitzia tamnoides*, from the Ural Mountains, and the wild beet, *Beta lomatogoma*, from Anatolia.

Experiments at the Kleinwanzleben Research Institute in the transmission of beet mosaic by juice inoculations gave negative results, and the suggestion is made that Verplancke's reputed success in this operation is based on an erroneous interpretation of his observations [ibid., xiv, p. 72].

MAGEE (C. J.). **Downy mildew of Beetroot. A disease new to the State.**—*Agric. Gaz. N.S.W.*, xlvi, 10, pp. 571–572, 2 figs., 1935.

An outbreak of beet downy mildew (*Peronospora schachtii*) [*R.A.M.*, xv, p. 190], apparently the first record for New South Wales, occurred in 1935 in a market garden near Sydney, approximately 25 per cent. of the crop becoming affected. There is evidence that the infection was introduced into Australia in imported seed. As beets are grown locally under irrigation it appears to be probable that significant losses will occur in New South Wales wherever the disease is introduced. Notes are given on the symptoms, economic importance, and seed-borne nature of the disease, and the paper terminates with brief recommendations for control by the use of clean seed and the avoidance of presumably infected soil.

LEACH (L. D.) & DAVEY (A. E.). **Toxicity of low concentrations of ammonia to mycelium and sclerotia of Sclerotium rolfsii.**—*Phytopathology*, xxv, 10, pp. 957–959, 1 graph, 1935.

Aqueous solutions of ammonia (50 p.p.m.) for exposures of 24 hours have been found toxic to the mycelium of *Sclerotium rolfsii*, the agent

of a serious root rot of sugar beets in California [*R.A.M.*, xv, p. 70], while by increasing the strength to 150 p.p.m. the necessary period of contact was reduced to two hours. The minimum concentrations required to destroy the more resistant sclerotia within periods of 24 and 72 hours were, respectively, 250 and 150 p.p.m. of ammonia. Formaldehyde at equivalent concentrations took longer to kill the mycelium and sclerotia of *S. rolfsii* than ammonia in these tests. In field trials, either anhydrous ammonia or ammonium sulphate [cf. *R.A.M.*, xiii, p. 639], dissolved in irrigation water in concentrations of about 300 p.p.m. of ammonia, significantly reduced the percentage of root rot in sugar beets, the increased yield of which (9 as compared with 5 tons per acre) more than sufficed to cover the cost of the treatments.

Davey (A. E.) & Leach (L. D.). **Toxicity of compounds of ammonia to Sclerotium rolfsii.**—Abs. in *Phytopathology*, xxv, 9, pp. 895–896, 1935.

Laboratory experiments were carried out to ascertain the reason for the proved beneficial effect of ammonium sulphate in the reduction of losses among sugar beets in soils of P_H 7 to 7·9 from *Sclerotium rolfsii* [see preceding abstract]. It was found that solutions containing 41·2 millimols of ammonia as ammonium sulphate per litre and saturated with calcium carbonate, giving a P_H of 7·8, were toxic to the mycelium in five days. Solutions of ammonium bicarbonate and dibasic ammonium phosphate at P_H 7·5 and respective concentrations of 17·8 and 14·7 millimols of ammonia were also lethal in the same period to immersed mycelium. These data are considered to suggest that ammonia, applied to the soil as solutions of anhydrous ammonia or ammonium salts, may be the effective agent, at a sufficiently high P_H value, in the reduction of sclerotial infection by inhibiting the development of the fungus.

Campbell (L.). **Downy mildew of Peas caused by Peronospora pisi (De B.) Syd.**—*Bull. Wash. St. agric. Exp. Sta.* 318, 42 pp., 7 figs., 1 graph, 1935.

This is a tabulated account of the author's investigation in Washington State of downy mildew of peas, the causal organism of which is commonly referred to as *Peronospora viciae* [*R.A.M.*, xii, p. 340]. The pea fungus, however, was not observed to occur naturally on species of *Vicia* growing in infected pea fields and failed to infect them and a number of other legumes under experimental conditions; furthermore the only downy mildew occurring naturally on a local vetch (*V. gigantea*) was shown to differ from the pea fungus both morphologically and in its pathogenicity, while both differed morphologically from specimens of *P. viciae* received from Sydow in Europe. The author, therefore, accepts for the pea organism Sydow's binomial of *P. pisi*, the American fungus agreeing with his description of this species, except that the conidiophores of the former measure 300 to 1,300 μ instead of 250 to 450 μ. An emended English description is given to include the oospores, which were not found by Sydow but occurred abundantly in systemically infected plants; they are greenish-yellow, reticulate, and 26 to 43 μ in diameter, the areolae being 8 to 12 μ in

diameter. The fungus on *V. gigantea* is considered to be new to science, and is named *P. vicicola* [with an English diagnosis]; it differs from other species of *Peronospora* on *Vicia* in its oospores, which are bright brown, 27 to 44 μ, with areolae 1 to 1·5 μ in diameter. Like *P. pisi*, *P. vicicola* was shown experimentally to be strictly specialized as a parasite to its own host.

In addition to causing local infections on the pea leaves, stipules, and pods [ibid., xi, p. 75], occasionally *P. pisi* may infect the host systemically, in which case either a portion or the entire plant is dwarfed, often rosetted and porcellaneous in character, while the entire lower surface of the leaves and often other parts also may be covered with a downy mycelium. When the entire pod of such plants is not involved, infection is restricted to the proximal end; infected pods usually show a proliferation of the endocarp.

Field observations and greenhouse experiments showed that soil contaminated with the oospores of the fungus is a common source of primary infection, but that in new areas the disease may be introduced with pea seed carrying the pathogen in the seed coat. Wind and splashing rain are two important agents of conidial dissemination, but there was evidence that the conidia are not viable if blown to any great distance, since they are killed by 15 minutes' desiccation. Other tests showed that infection results when the host plants retain free moisture on their surface for four hours but not for two hours, and that its development is favoured by temperatures from 32° to 70° F. For the control of the disease in regions where climatic conditions are conducive to the fungus, crop rotation is recommended, as well as the use for sowing of seed originating from arid areas, since hot air or hot water treatment of the seed was not effective or severely injured the seed. Limited greenhouse tests, where the time of inoculation could be controlled, indicated that Bordeaux-penetrol [ibid., xiii, p. 315] mixture affords good protection against conidial infection, if the plants are sprayed before inoculation.

Observations in the coastal areas of Washington in 1933 and 1934 showed practically 100 per cent. infection of the pea fields with downy mildew by the time the plants had reached the blossom stage, pod infections being occasionally as high as 35 to 40 per cent. All the local varieties of peas tested were found to be equally susceptible to the disease.

PRICE (W. C.). **Classification of southern Celery-mosaic virus.**— *Phytopathology*, xxv, 10, pp. 947–954, 4 figs., 1935.

The inoculation by rubbing of *Zinnia elegans* (Golden Gem Midget) with the southern celery mosaic virus (celery virus 1) [*R.A.M.*, xv, p. 191] was found to induce in the test plants specific immunity from a subsequent infection by a yellow strain (6) of the cucumber mosaic, agreeing in this behaviour with other strains of cucumber mosaic [ibid., xiv, p. 813]. Southern celery mosaic and cucumber mosaic, therefore, are closely related immunologically and should, it is believed, be classified as strains of the same virus. The southern celery mosaic virus appears to be more infectious than ordinary cucumber mosaic, a fact that may explain its wider host range, higher thermal death

point, and greater resistance to ageing *in vitro*. Corroborative evidence for this hypothesis is further afforded by the similarity of the symptoms induced by the celery and cucumber mosaic viruses in maize, *Commelina communis* (both heretofore regarded as immune from the latter), and cowpea (hitherto considered to be immune from the former). These data are thought to exemplify the utility of immunological reactions for the purpose of elucidating plant virus relationships.

Brown (W.). **On the Botrytis disease of Lettuce, with special reference to its control.**—*J. Pomol.*, xiii, 3, pp. 247–259, 1935.

After briefly referring to Abdel-Salam's investigations on the disease of lettuce caused by *Botrytis cinerea* in England [*R.A.M.*, xiii, p. 559], the author gives a tabulated account of his own experiments on its control. In 1934 he found that, while steeping the lettuce seedlings raised in cold frames in a 0·5 per cent. uspulun or nu-green solution before transplantation in the field gave appreciable control [loc. cit.], this method involves risk to the plants. Five minutes' immersion in a 1 in 1,000 mercuric chloride solution plus potassium iodide gave as good control of the fungus as 25 minutes in mercuric chloride alone, but the damaging effect on the plants ran in a like direction. Tests were also made of a non-mercurial dust 'brassisan' (the effective constituent of which is a chloronitrobenzene preparation), which other work in progress had shown to combine efficacy against club root [*Plasmodiophora brassicae*] and damping-off of *Brassica* spp. with innocuousness to the plants; a single dusting of the collars of the lettuce seedlings, the roots of which were protected against the dust, raised the average percentage of the survivors in the field to 73, as against 27·5 of the controls.

During the 1934–5 season the tests were continued in two series, in one of which lettuce was sown in cold frames in the middle of October, and the other in the middle of November, the treated frames receiving one or two applications of brassisan during growth. The seedlings were transplanted in March 1935, either without further treatment, or were dusted after preliminary spraying (which increases the efficacy of the dust) a few hours beforehand. The results indicated that the seedlings from the early sown, undusted frames averaged only 150 in number and gave a negligible survival percentage in the field, which, however, was raised approximately to 50 per cent. by the single dusting at the time of transplantation. The seedlings from the early sown frames dusted once only, though considerably more numerous (790), were similar in quality to those from the undusted frames. The number of seedlings in the early sown, twice dusted frame was comparable to that in the once dusted (675), but the seedlings gave a much higher survival, which was slightly raised by the pre-transplantation dusting, when planted without further treatment. The seedlings from the late-sown, undusted frames averaged 1,720 in number and those from the once and twice dusted 6,810 and 8,270, respectively; the survival of plants from the undusted frames was always considerably lower than that of the twice dusted, both being planted without further treatment. The average percentage of late-sown seedlings showing *B. cinerea* stem lesions was 34 in the controls, as against 3 and 2·2,

respectively, in the treated frames. During the period of transplantation there was substantial evidence that the seedlings still in the frames were deteriorating in their capacity to survive in the field, presumably on account of their progressively increasing overcrowding.

A striking confirmation of these results was obtained with lettuce seedlings grown in boxes, and also in a series of plots which were sown in the field in the middle of September, so as to stand the winter in the open. In this series, the number of mature plants obtained from each unit of seed drill was increased four or five times by dusting with brassisan.

WILSON (J. D.). **New treatments for Cucumbers.**—*Bi-m. Bull. Ohio agric. Exp. Sta.*, xx, 173, pp. 68–75, 1935.

A tabulated account is given of field experiments since 1927 at the Ohio Agricultural Experiment Station to find a treatment, both effective and harmless to the host, for the control of cucumber diseases, of which bacterial blight (*Bacterium*) [*Bacillus*] *tracheiphilus* [*R.A.M.*, xiv, p. 684], angular leaf spot (*B.* [*Bact.*] *lacrymans*) [ibid., xiv, p. 416], anthracnose (*Colletotrichum lagenarium*), [ibid., xiv, p. 426], downy mildew (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis*) [ibid., xiv, p. 683], and scab (*Cladosporium cucumerinum*) [ibid., xiv, p. 811] are the most common in that State. The various treatments tested were compared with four mixtures which are in more or less common use on cucumbers, namely, gypsum and calcium arsenate, 20–1; hydrated lime and lead arsenate 20–1; Bordeaux mixture plus calcium arsenate, 2–3–50–2; and monohydrated copper sulphate, hydrated lime, and calcium arsenate, 15–80–5; the first two of which have given excellent plant growth and good yields, while the last two have afforded the best control of bacterial wilt but often cause stunting of the plants. Of the new treatments tried, very good results were obtained with a 1 in 5 mixture of calcium arsenate and flour, which is adhesive to the leaves, affords good growths of the hosts, and controls bacterial blight well (0·8 per cent. infection against 30·0 in the controls); flour was found to be somewhat superior to clay or talc as a diluent and sticker for various fungicides and insecticides in 1934. Good results were also obtained with a number of spray or dust combinations containing copper compounds, such as copper phosphate, basic copper chloride, and basic copper sulphate [ibid., xiv, p. 382] of comparatively low solubility; plants treated with them gave more vigorous growth and better yields than those receiving Bordeaux mixture; in combination with a good sticker and insecticide they controlled bacterial wilt well (e.g., 1 part of any one of them with flour (5 parts) and calcium arsenate (1 part) gave, respectively, 6·6, 0·8, and 5·0 per cent. infection against 30 per cent. in the control). Their action on leaf spot and other diseases has not yet been adequately determined, and experiments are being continued to establish what particular combination of a copper compound, sticker-diluent, and arsenate can be recommended for use on cucumbers and melons.

BOEWE (G. H.). **Soybean downy mildew in Illinois.**—*Plant Dis. Reptr*, xix, 16, pp. 257–258, 1935. [Mimeographed.]

Considerable damage was caused to the soy-bean crop (Virginia and

Illinois varieties) in southern Illinois in 1935 by downy mildew (*Peronospora manshurica*) [*R.A.M.*, xiii, p. 656], first recorded in the State in 1929, the fungus destroying on an average some 10 per cent. of the leaf area and sometimes attacking every plant in a field. The incidence of infection was probably increased by the heavy mid-June rainfall.

NICOL (H.). **Mushroom cultivation without stable manure.**—*Gdnrs' Chron.*, xcviii, 2546, p. 270, 1935.

The valuable use of adco in the production of artificial farmyard manure for the cultivation of edible mushrooms [*Psalliota campestris* and *P. arvensis*: *R.A.M.*, xiv, p. 555] is briefly indicated. A special form of the preparation suitable for this purpose is stated to be now on the market.

LUTHRA (J. C.), SATTAR (A.), & BEDI (K. S.). **Life-history of Gram blight [Ascochyta rabiei (Pass.) Lab. = Phyllosticta rabiei (Pass.) Trot. on Gram (Cicer arietinum L.)] and its control in the Punjab.**—*Agric. Live-Stk India*, v, 5, pp. 489–498, 2 pl., 1 map, 1935.

This is a popular account of the work done up to date in the investigation of gram (*Cicer arietinum*) blight (*Ascochyta rabiei*) in the Punjab, much of which has already been noticed in this *Review* from other sources [*R.A.M.*, xii, p. 264; xiii, pp. 346, 611]. The additional points of interest which may be noticed are as follows. It was definitely established that infected gram material remaining in the field from one crop is an important source of primary infection for the next, experiments having shown that *A. rabiei* remains alive for more than two years in such material, unless it is buried at least two inches deep in the soil, when the fungus is killed in a month provided sufficient soil moisture is present. Usually primary infection foci in a field are limited and isolated, but in windy and wet early seasons the infection is rapidly spread by rain and also by the distribution over the field of infected debris, apt to be broken off from the brittle diseased plants and transported for hundreds of yards by strong winds. It was also conclusively shown that soil infection with the fungus does not play any part in the perpetuation of the disease. The minimum temperature for growth and spore germination was below 10°, the optimum 20°, and the maximum about 32·5° C. Very few spores germinate and cause infection during December and January, due to the very low temperatures which prevail at that time; infection usually occurs in February and March, when temperature rises to 70° or 80° F.

For purposes of control it is recommended that infected gram plants should be removed from the fields at harvest time or ploughed under during summer, at least two or three months before sowing the new crop. Infected straw may be safely fed to cattle, as the spores were shown not to survive passage through the animals. Seed should be obtained from regions where the disease does not occur. Observations made during several years indicated that gram sown in mixture with wheat, barley, taramira (*Eruca sativa*), sarson (*Brassica campestris*) [var. *sarson*], or any other suitable crop suffers less from the disease than pure stands, and this measure is also recommended wherever possible to minimize the losses caused by blight.

Rives (L.). **Hybrides et court-noué.** [Hybrids and court-noué.]—*Progr. agric. vitic.*, civ, 33, pp. 159–162, 1935.

After briefly referring to his previous communications on the pathological condition of the vine in two vineyards in the department of Var, now believed to be due to adverse soil conditions in association with the endophytic mycorrhizal fungus [court-noué: *R.A.M.*, iii, p. 501] and bacteria [ibid., ix, p. 504], the author states that Jacquez hybrid vinestocks which were planted some seven or eight years earlier in the worst diseased parts of the estates have remained strikingly healthy in the midst of badly stunted and misshapen stocks of *Vitis vinifera*, either on their own roots or grafted. The examination of their roots showed a very slight invasion of the root system by the mycorrhizal fungus, which was very abundant in the cortical tissues of the roots of the diseased stocks. A high degree of resistance to the trouble was also exhibited by the hybrids Couderc 13 and S. 5813; both of which, like Jacquez, have a very hard and dense wood. These observations indicate that under environmental conditions similar to those that prevail in the estates, court-noué may be controlled by planting resistant hybrids on Jacquez stocks, promising results having been obtained with various *vinifera* grafts.

D. H. **Résultats d'un traitement du court-noué.** [The results of a treatment of court-noué.]—*Progr. agric. vitic.*, civ, 40, pp. 328–329, 1935.

Some 50 ares [rather more than 1 acre] of 4986×3309 vines very severely affected with court-noué [*R.A.M.*, xiv, p. 616 and preceding abstract] were treated with zinc sulphate, 250 gm. to each vine [ibid., xiv, p. 347], as well as with various fertilizers, while the land was also drained and the vines sprayed with pyralesca. Practically all the vines made a very satisfactory recovery from the disease.

Berger (G.) & Bouhelier (R.). **Les principales maladies de la Vigne en Chaouïa au cours de l'année 1934.** [The chief Vine diseases in Shawia during 1934.]—*Progr. agric. vitic.*, civ, 40, pp. 329–333, 1935.

Esca disease of the vine (attributed, on account of the yellow mycelium present, to *Polyporus* [*Fomes*] *igniarius*) [*R.A.M.*, x, p. 774; cf. also xii, p. 486] is stated to have been observed for the first time in the vicinity of Casablanca, Morocco, in August 1934. The affected plants showed a drying-up of the leaves with an internal necrosis of the stem which extended to the old pruning wounds. The damage caused, though not great, was appreciable.

L[arue] (P.). **La maladie de la moelle en Autriche.** [The pith disease in Austria.]—*Progr. agric. vitic.*, civ, 41, pp. 354–356, 1935.

In a recent communication to the periodical *Weinland*, [*1935*, 5–6, 9 pp.], which is briefly summarized in this paper, Zweigelt and Voboril state that the pith disease of the vine [*R.A.M.*, xiv, p. 675] has been found to occur throughout Lower Austria, as well as in Jugo-Slavia and the Burgenland abutting on Hungary; it has not been recorded either

in Styria or Germany. In young vine plants, the pith of which has been destroyed entirely, adventitious roots are produced at the crown node at soil-level. In the host the disease may spread either upwards or downwards, and both healthy and diseased shoots may be present on the same vinestock. A feature of diagnostic value is that while in pruning stubs which die naturally the wood is light brown with a narrow and yellow pith, in stubs killed by the disease the wood is dark brown and the pith dark and enlarged. Other symptoms which differentiate the pith disease from similar diseases are concisely indicated.

Infection of vinestocks frequently originates at the graft, and the attention of Austrian vine-growers is called to the proper method of cutting grafts, since cutting them at the upper end too close to a node weakens the natural resistance of the nodal diaphragm to penetration by fungi. The note terminates with a brief indication of the control experiments now in progress.

FAES [H.] & STAEHELIN [M.]. **Le coître de la Vigne (Coniothyrium diplodiella).** ['Coître' of the Vine (*Coniothyrium diplodiella*).]—*Terre vaud., 1935*, pp. 133, 154, 172, 193, 1935. [Abs. in *Neuheiten PflSch.*, xxviii, 6, pp. 170–171, 1935.]

The agent of the 'coître' (white rot) of the vine (*Coniothyrium diplodiella*), first observed in Italy in 1878, is stated to be responsible for enormous losses among the highly susceptible Gutedel stands in districts of French Switzerland liable to be visited by severe hailstorms [*R.A.M.*, xiii, p. 351]. The accumulation of spores in the soil only occurs in regions subject to hailstorms, and inoculation experiments with soil from the Canton of Valais, where hail is almost unknown, gave negative results. Soil sterilization with formalin or acetic acid is effective at the rate of 10 l. per sq. m., but is too expensive for practical purposes. In order to permit of infection by *C. diplodiella*, the sugar content of the grapes must reach a certain minimum and the sugar-acidity ratio must be favourable; hence the virtual absence of coître, even in the presence of hail, immediately after flowering and shortly before maturity. Some degree of control may be achieved by prompt removal of the hail-struck fruits [ibid., xi, p. 692], while protective substances, such as soda, calcined magnesia, or borax to induce alkalinity, and drying substances (e.g., certain kinds of cement) to retard spore germination, or mixtures of both groups, should be applied within 16 hours to prevent penetration by the germ-tubes.

SĂVULESCU (T.) & RAYSS (T.). **Les espèces de Cercospora parasites des feuilles de Vigne en Palestine.** [The species of *Cercospora* parasitic on Vine leaves in Palestine.]—*Rev. Path. vég.*, xxii, 3, pp. 222–241, 6 pl., 1935.

Notes are given on six species of *Cercospora* found on vine leaves, viz., *C. leoni* n.sp., *C. coryneoides* n.sp. [both with Latin diagnoses], *C. vitiphylla*, *C. roesleri* [*R.A.M.*, ix, p. 504; xiii, p. 617], all from Palestine, *C. vitis* (syn. *C. viticola*) [ibid., ix, pp. 505, 613] recorded from most viticultural regions, and *C. sessilis* from the Caucasus.

C. leoni produces scattered, angular, irregular spots 1 to 3 mm. wide on both leaf surfaces, olive-brown on the under one. The rigid, brownish,

non-septate conidiophores measure 15 to 35 by 4 to 6 μ and are arranged in fascicles 45 to 135 μ in diameter by 60 to 75 μ high, with a tubercular, stromatic, colourless subiculum. The vermiculate, straight or curved, olivaceous, solitary, continuous, later 1- to 2-, occasionally 3-septate, conidia measure 18 to 40 by 6·5 to 7 μ.

C. coryneoides produces scattered, angular, irregular, dark brown spots 0·5 to 1 mm. wide on both leaf surfaces; they frequently coalesce, covering a large area, especially on the lower surface. The fascicle of conidiophores measures 90 to 135 by 60 to 90 μ, and has a tubercular, sclerotic, spherical or elongated, blackish-brown subiculum at the base measuring 54 to 90 by 60 to 90 μ. The sinuous, septate conidiophores, dark brown at the base, lighter towards the apex, measure 30 to 110 by 4 to 6 μ. The straight or curved, olivaceous, solitary 3- to 5-septate conidia are constricted at the septa and measure 30 to 48 by 4 to 7 μ.

SĂVULESCU (T.), SANDU-VILLE (C.), RAYSS (T.), & ALEXANDRI (V.). **L'état phytosanitaire en Roumanie au cours de l'année 1933–34.** [Phytosanitary conditions in Rumania during the year 1933–1934.] —*Inst. Cerc. Agron. al României*, 24, 59 pp., 7 figs., 1935. [Rumanian, with French translation.]

In the autumn of 1933 rust (*Puccinia* spp.) infection of winter wheat was insignificant in Rumania, and in the following spring, owing to exceptionally dry weather conditions, it was less serious than in previous years. The first attack of *P. triticina* was noted on 26th April, and at the end of June, following a rainy period, a severe outbreak occurred on wheat showing retarded vegetation, particularly on spring varieties [*R.A.M.*, xiv, p. 214]. Heavy losses were caused by loose smut of wheat (*Ustilago tritici*), and Cipăianu 714 wheat was very severely attacked by *Septoria tritici* [ibid., xiii, p. 434]. *Fusarium nivale* [*Calonectria graminicola*: ibid., xiii, p. 521] reduced the wheat yield in one field by 80 per cent.; the attack occurred on plots sown in early autumn and in which the wheat had made good growth, but wheat sown after 15th September remained unaffected. *Helminthosporium turcicum* [ibid., xiv, p. 685], first recorded in Rumania in 1933, caused severe infection of maize in several localities and also occurred on sorghum near Bucarest. Foot rot of barley was caused by *F. culmorum* [ibid., xiii, p. 623].

Attention is drawn to the important part played by self-sown plants in the dissemination of most of the above-mentioned fungi, which live over on volunteer plants until the winter cereal crops appear. Cereal rust spores fall on the ground before and during harvest, remain alive on the stubble, and pass on to self-sown plants, where they produce new spores which in turn infect the young winter wheat. The severity of the autumn infection of cereal rusts depends on the date of sowing and the meteorological conditions, and owing to favourable weather in the autumn of 1934, severe infection was general throughout Rumania. *Leptosphaeria tritici* [ibid., viii, p. 290] is transmitted to wheat in autumn from self-sown plants, as is *L. passerinii* to barley; both cause a yellow discoloration of the leaves. *Erysiphe graminis*, commonly present on wheat and barley leaves, spreads during summer from self-sown plants to autumn crops.

Sunflowers were severely infected by *P. helianthi* [ibid., xiv, p. 747], and soy-beans showed the presence of mosaic [ibid., xi, p. 424; xiv, p. 82]. The virus disease of eggplants previously reported [ibid., xiv, p. 215] was again very prevalent, largely owing to heavy insect infestation; 50 to 60 per cent. of the plants in the hotbeds in market-gardens in one area were rendered unsaleable by the disease, and occasionally affected plants completely dried up.

Rose powdery mildew [*Sphaerotheca pannosa*: ibid., xiv, p. 711] was widely present, though resistance was shown by the Willoomer and New Dawn varieties. *Sclerotinia libertiana* [*S. sclerotiorum*] attacked rosebuds; the flower receptacles and the peduncles turned black, the buds withered, and the flowers failed to open. Rose black spot (*Diplocarpon rosae*) [ibid., xiii, p. 771; xiv, p. 382] was more serious than usual.

Apple bark necrosis (*Dermatea corticola*) [see below, p. 260] was frequently associated with *Sphaeropsis malorum* (*Physalospora cydoniae*) [*P. obtusa*: ibid., xv, p. 31]. In one apple orchard, 60 to 70 per cent. of the fruits were affected by glassiness [ibid., xiii, p. 316], a physiological condition apparently due to atmospheric humidity and excessive growth.

A severe outbreak of vine *Oidium* (*Uncinula necator*) was reported from one locality, while in some districts losses (which in one case reached 50 per cent.) were caused to vines by *Rosellinia necatrix* [cf. ibid., xi, pp. 24, 765]. Much damage was done to the grape berries by widespread infection by *Botrytis cinerea* and *Charrinia diplodiella* [ibid., iv, p. 460].

MARTYN (E. B.). **Report of the Botanical and Mycological Division for the year 1934.**—*Div. Rep. Dep. Agric. Brit. Guiana, 1934*, pp. 105–108, 1935.

During the period under review, a further outbreak of citrus scab [*Sporotrichum citri*: *R.A.M.*, xiv, p. 218] occurred in a citrus nursery at Hosororo. A grower in the Pomeroon district of British Guiana reported that several of his coco-nut trees which had appeared to be dying from wilt [attributed to physiological causes: *R.A.M.*, xi, p. 26] recovered as a result of burning off all but the heart leaves. The success of this treatment has also been reported on one or two other occasions.

In a search for individual cacao trees showing resistance to witches' broom (*Marasmius perniciosus*) [ibid., xv, p. 76] the few apparently healthy trees selected were later found to be diseased. Some wild cacao in the Ranaku Mountains is stated to be free from the disease, but it is thought probable it would succumb if grown in an infected region.

Pineapples were attacked by 'black eye' disease [ibid., xv, p. 137] on the new Pineapple Company's estate, where a number of the plants also developed symptoms entirely similar to those of the wilt reported from the West Indies by Nowell and Stockdale.

Guava suffered from sun crack of the fruits, a condition which usually affects a certain percentage of ripening fruit, particularly when a wet spell is followed by several dry, sunny days; the fruits split open, but are still suitable for culinary purposes.

SHEPHERD (E. F. S.). **Botanical and Mycological Division.**—*Rep. Dep. Agric. Mauritius, 1934*, pp. 19–21, 1935.

In tests of sugar-cane varieties in Mauritius during 1934 for resistance to gumming disease (*Bacterium vascularum*) [*R.A.M.*, xiii, p. 494] a number were found to be sufficiently resistant to warrant further propagation.

Tobacco black shank (*Phytophthora parasitica*) [loc. cit.] was fairly widespread during the warmer months of the year. In resistance trials one strain of Amarello was much less susceptible than the other varieties tested, and selections are to be made from it for further trials; the Constant, Blue, and two Florida varieties were highly resistant. Serious outbreaks of tobacco mosaic [ibid., viii, p. 73] occurred on two estates in the Black River district.

Experimental evidence indicated that spraying with sulphemulsol [ibid., xiii, p. 522] may prove of use against dry side rot of pineapple fruits [ibid., xiv, p. 84]. A few cases of pineapple stem bleeding and top rot associated with *Ceratostomella paradoxa* [ibid., xiv, p. 455] occurred in one locality; the top rot appeared to be secondary to the stem disease.

Potato bacterial wilt (*Bacterium solanacearum*) [ibid., xv, p. 111] was present in several districts. Many potato consignments from abroad were infected with powdery scab (*Spongospora subterranea*) [ibid., xiv, p. 330], but when planted, the infected tubers gave a healthy crop, the climatic conditions prevailing in Mauritius apparently acting as a deterrent to the disease.

New records included powdery mildew of potato (*Oidium* sp.) [cf. ibid., xiv, p. 83] and a collar rot of young papaw (*Carica papaya*) associated with and probably caused by a *Phytophthora* [ibid., xiv, p. 216].

STOREY (H. H.). **Report of the Plant Pathologist.**—*Rep. E. Afr. agric. Res. Sta. 1934–35*, pp. 12–16, 1935.

A study of the mechanism of the process by which *Cicadulina mbila* inoculates maize with streak [*R.A.M.*, xiv, p. 146] showed that the virus is transmitted through the stylets which must penetrate to the phloem for successful inoculation. The transfer of the virus in the saliva appears to be the only tenable hypothesis, but the outcome of experiments on the subject was to leave the function of the saliva in doubt. The inoculative ability of the insects was found to vary greatly; all pure, active individuals transmitted the virus if allowed prolonged contacts with diseased and healthy plants successively, but showed marked differences in their ability both to inoculate plants successfully during short contacts and to remain infective after a single contact with the source of the virus. A normally active, fertile line of *C. zeae* was infertile when crossed with a pure, inactive line, but as minute morphological differences were noted between the two lines, *C. zeae* may possibly be a group of closely similar species.

Of four cassava varieties received from the Gold Coast, immune from or highly resistant to mosaic [ibid., xiv, p. 428; xv, p. 76] in their country of origin, the two so far tested in East Africa, 'Calabar' and

'Sareso', proved much more susceptible than the local varieties, showing that the East and West African strains of the virus are different, though the symptoms in the two regions manifested no certain differences. Several strains of the virus, distinguishable by their symptoms under controlled conditions, are present in the Amani district, and of a large collection of indigenous varieties brought together at Morogoro none survived mosaic attack. The introduction of overseas varieties under strict quarantine (the importance of which in preventing the entry of virulent strains of the virus is emphasized) should, however, be continued in the hope of finding some resistant to the local strains of mosaic. The only other measure of control available at present is the selection of disease-free planting material, which would considerably increase yields even where extensive secondary spread occurs. In many regions such selection is almost impossible, though at the higher elevations round Amani and probably elsewhere in the mountains secondary spread is slight and healthy crops can easily be raised. Experimental evidence showed that within one month of the appearance of secondary infection the virus invariably passed to the base of the stem, though it usually failed to pass up into the side branches or into the other stems arising from the same original sett.

FINDLAY (A. J.). **Annual Report of the Department of Agriculture, Zanzibar, 1934,** 32 pp., 1935.

Mortality from 'sudden death' of cloves [*Eugenia caryophyllata*: *R.A.M.*, iii, p. 78] appears to be increasing in Zanzibar; only the older trees are attacked, and both the predisposing cause and the root fungus that is the primary cause remain unidentified.

Cassava mosaic [see preceding abstract] is widespread at Pemba, and investigations are being carried out to discover a satisfactory resistant local variety.

JACZEWSKI (A. A.). Бактериозы растений. [Bacterioses of plants.]—viii+712 pp., 120 figs., Госуд. Издат. Совх. и Колх. Литер. [State Publ. Off. Lit. Collect. & Co-op. Farming], Leningrad, 1935.

In a brief foreword N. A. Naoumoff states that the manuscript of this very comprehensive treatise on the bacterial diseases of plants was completed by Jaczewski at the end of 1931, a few months before his death. The information contained in it has been fully revised and brought up to date by the former. The work is divided into two main parts, a general and a special. The eleven chapters of the first part give a brief historical outline of the discovery of bacteria and of the development of their study, followed by general discussions on the morphology and biology of the organisms, their relationships to environmental conditions, their multiplication, life-cycles, and classification (the system proposed by Miss Elliott [*R.A.M.*, x, p. 120] being considered the most satisfactory on the whole), the part they play in the general economy of the world, the inter-relationship between the organisms and their hosts, the mode in which they infect their hosts and the reaction of the latter to them, the geographical distribution of the organisms, the methods commonly used in their investigation, and their control, both in animal and plant pathology.

The special part gives a more or less complete account of all the bacterial diseases hitherto recorded, arranged according to the host plants under the headings: cryptogams, conifers, monocotyledons, and dicotyledons. It also contains a comparative table of the morphological and biochemical characters of the plant parasitic organisms, and some supplementary information concerning the newest methods of staining.

Apart from numerous references to literature given in the form of footnotes, the bibliography appended at the end of the volume comprises 1,734 titles, and the book terminates with a full index of all the bacterial organisms mentioned in the work, and another one of their plant hosts.

STAPP (C.). **Contemporary understanding of bacterial plant-diseases and their causal organisms.**—*Bot. Rev.*, i, pp. 405–425, 1935.

This is a short review of the progress attained since the beginning of this century in the study of bacterial diseases of plants and of their causal organisms, the elucidation of the true status of many of which has been a feature of the more recent investigations. Serological tests (comprising agglutination and especially precipitation reactions) are regarded as most important in establishing the identity of species, and, when positive, are to be relied on even though there be definite cultural or physiological differences. The bibliography appended at the end includes 130 titles.

KOSTOFF (D.). **Heritable tumours in plants experimentally produced.**—*Genetica*, xvii, 3–4, pp. 367–376, 3 figs., 1935.

The non-parasitic tumours resulting from the mutual activity of the maternal and paternal contributions in species hybrids of *Nicotiana* [*R.A.M.*, xiii, p. 498], e.g. *N. rustica*×*N. cavanilesii*, *N. paniculata*× *N. langsdorffii*, *N. glauca*×*N. langsdorffii* and the reciprocal cross, were shown to develop quite independently of the chromosome numbers in the parental plants. As a rule the excrescences, which first appear on the roots, then on the stems (the largest near the ground), and rarely affect the leaves, possess the same number of chromosomes as the hybrid, but portions of the tumours may have a doubled or an altered chromosome complement. Similar tumours or fasciations to the foregoing were also formed in back-crosses between (*N. glauca*× *N. langsdorffii*) and *N. langsdorffii*, the progeny of which were mostly triploid, and on the amphidiploids produced by intercrossing *N. glauca* and *N. langsdorffii*; the fertile hybrids of these two species not only form tumours but also transmit this character to their progeny. Here again the chromosome number of the tumours generally agreed with that of the plants bearing them, but there were various aberrations comparable with those found in human cancer, the implications of which are discussed [ibid., xv, p. 139, and next abstract].

RIKER (A. J.) & BERGE (T. O.). **Atypical and pathological multiplication of cells approached through studies of crown gall.**—*Amer. J. Cancer*, xxv, 2, pp. 310–357, 3 figs., 1935.

In this paper the authors give a comprehensive critical review of the work done up to date in the investigation of crown gall (*Phytomonas*

[*Bacterium*] *tumefaciens*) [*R.A.M.*, xv, p. 5], the apple hairy-root organism (*P.* [*Bact.*] *rhizogenes*) [ibid., xiv, p. 452], and related plant diseases, in which the hyperplastic and hypertrophic growth of the host tissues is comparable with atypical and pathological cell proliferation in man and animals [cf. preceding abstract]. In their opinion the data collected indicate that studies with plant materials offer an excellent opportunity for clarifying many basic questions relating to this process in higher animals, both because of the experimental advantages presented by them, and because of the probability that a fundamental contribution towards establishing the cause of cell stimulation in one field may clarify the general problem of cancer and related diseases.

A bibliography comprising nearly 200 titles is appended.

Boivin (A.), Marbe (M.), Mesrobeanu (Lydia), & Juster (P.). **Sur l'existence, dans le Bacillus tumefaciens, d'une endotoxine capable de provoquer la formation de tumeurs chez les végétaux.** [On the existence in *Bacillus tumefaciens* of an endotoxin capable of inducing tumour formation in plants.]—*C. R. Acad. Sci., Paris*, cci, 21, pp. 984–986, 1935.

A specific glucido-lipidic complex, representing at once the complete somatic antigen and the principal endotoxic constituent, was isolated from *Bacillus* [*Bacterium*] *tumefaciens* [see preceding and next abstracts] by a treatment with trichloracetic acid involving coagulation of the microbial proteins and diffusion of the substance in question from the dead organism. The toxicity of the complex to mice proved to be of a very mild order as compared with that of similar extracts from organisms of the *Eberthella* group. Repeatedly injected into rabbits the *Bact. tumefaciens* antigen induced the development of precipitins in the blood-stream. Tumours closely resembling those caused by inoculation with the living organism were formed after a month on Grand Soleil sunflower stems into which the antigen was injected, the number of positive cases being 30 out of 36 for inoculation with the living organism and 28 out of 36 for the antigen, while two further lots of 36 plants inoculated, respectively, with physiologic serum and the antigenic extracts of other bacilli developed no outgrowths.

Magrou (J.). **Immunité et hypersensibilité du Pelargonium vis-à-vis des réinfections par le Bacterium tumefaciens.** [The immunity and hypersensibility of the *Pelargonium* in respect of reinfections by *Bacterium tumefaciens*.]—*C. R. Acad. Sci., Paris*, cci, 21, pp. 986–988, 1935.

In a series of reinoculation experiments on 1st May, 1935, with a 48-hour-old culture of *Bacterium tumefaciens* on the stems of nine *Pelargonium* plants bearing voluminous excrescences resulting from previous infections three to four months earlier, only 25 out of a total of 285 needle-pricks gave positive results, the new tumours developing at an average distance of 14 cm. from the original ones [*R.A.M.*, viii, p. 116]. In seven control plants inoculated for the first time only 16 out of 126 pricks failed to cause neoplasms. The partial or total

immunity of the reinoculated plants was accompanied, however, by various localized or general symptoms of hypersensibility, such as internodal swellings, epidermal rupture, fusiform fissures, necrosis, or wilting. This hypersensitive condition is regarded as comparable to the pathological processes coinciding with the lysis of a given antigen on reinfection by the antibodies formed in human subjects at the first inoculation.

Die Getreideroste. [The cereal rusts.]—*Flugbl. biol. Reichsanst., Berl.*, 138–139, 4 pp., 1 col. pl., 1935.

Semi popular notes are given on the life-history and economic importance of cereal rusts in general and the symptomatology, biology, and control of yellow rust of wheat, rye, and barley (*Puccinia glumarum*), brown rust of wheat (*P. triticina*), rye (*P. secalina*), and barley (*P. simplex*) [*P. anomala*], black rust of wheat, rye, barley, and oats (*P. graminis*), brown rust of oats (*P. coronifera*) [*P. lolii*], and maize rust (*P. sorghi*) [*P. maydis*], with special reference to German conditions. The annual loss caused by cereal rusts in Germany is estimated at not less than RM. 200,000,000 [*R.A.M.*, xiv, p. 461].

PETIT (A.). **Les maladies cryptogamiques du Blé.** [The cryptogamic diseases of Wheat.]—*Ann. Serv. bot. Tunis*, xi, pp. 195–234, 4 pl., 1935.

In this paper the author gives a brief, semi-popular account of the morphology, biology, and control of the more important fungal diseases of wheat in Tunis, much of which has already been noticed in this *Review* from other sources [*R.A.M.*, xii, pp. 151, 153, 271; xiii, p. 360; xiv, p. 572]. The parasites are roughly divided into those that attack the roots and collar, the aerial organs, and those that infect the whole wheat plant. Some notes are also given on fungal diseases of secondary economic importance.

PETIT (A.). **Remarques sur la toxicité des anticryptogamiques pour les parasites de Blé.** [Notes on the toxicity of fungicides for the control of Wheat parasites.]—*Ann. Serv. bot. Tunis*, xi, pp. 235–263, 1935.

A detailed account is given in this paper of the relative fungicidal values, largely determined by empirical tests in Tunis [see preceding and next abstracts], of various chemical compounds and mixtures in the control of fungal diseases of wheat and other cereals, and more particularly of wheat bunt (*Tilletia* spp.) [*T. caries* and *T. foetens*], covered smut of barley (*Ustilago hordei*), loose smut of oats (*U. avenae*), and foot rot (*Cercosporella herpotrichoides*) [*R.A.M.*, xiii, p. 690; xv, p. 145]. Discussions are also given of the value of these preparations for preserving the seed-grain treated with them from insect attack, and of their action on the germinability and growth vigour of the treated grain. The paper terminates with a short note on the toxicity of certain reducing substances (sulphur, calcium cyanamide, polyoxymethylene) to rust (*Puccinia* spp.) spores.

PETIT (A.). **Le traitement des caryopses des céréales. Le soufre et le soufre cuprique.** [The treatment of cereal seed. Sulphur and cupric sulphur.]—*Ann. Serv. bot. Tunis*, xi, pp. 267–272, 1935.

The main feature of interest in this note is a table showing the results obtained in Tunis in 1934 and 1935 in the control of wheat bunt (*Tilletia levis*) [*T. foetens*], flag smut of wheat (*Urocystis tritici*), barley covered smut (*Ustilago hordei*), and loose smut of oats (*U. avenae*) by treating the seed-grain with 40 dusts, comprising a number of chemicals and proprietary preparations. These results entirely confirmed those reported in 1932 [*R.A.M.*, xii, p. 153] in regard to wheat bunt, and showed further that cuprous chloride may be mixed with sulphur dust; the mixture thus obtained (containing 25 per cent. cuprous chloride by weight) may be kept for a long time with no reduction in fungicidal value. The efficacy of copper carbonate may be considerably increased by mixing it with a homogeneous, finely divided carrier. Mercuric iodide dust (7 per cent.) was also efficacious. Wheat flag smut responded, generally, in the same way to the same compounds, but anhydrous copper sulphate was slightly less effective against it. *U. hordei* was completely controlled by dusting the seed-grain with the sulphur-cuprous chloride mixture; *U. avenae* is resistant to sulphur dusting of oat seed-grain, but is controlled by dusts containing either mercuric iodide, anhydrous copper sulphate, or neutral copper acetate.

BRÜCKNER (G.). **Brandiger Weizen als Wertminderer des Mahlgutes.** [Smutted Wheat as a factor in the reduced value of grist.]—*Z. ges. Getreidew.*, xxii, 11, pp. 218–222, 8 figs., 1935.

A semi-popular account is given of wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] in Germany with special reference to the effect of the disease on the milling quality of the grain [cf. *R.A.M.*, x, p. 716]. Great difficulties are presented by the various methods that have been devised for the detection in the grist of the spores of these fungi, some $3\frac{3}{4}$ millions of which are estimated to be contained in each bunt ball. So excessively light are these organs that 450,000 weigh only 0·001 gm.; in threshing operations they are readily scattered from the broken balls and disseminated among the grains, usually alighting in the beard hairs, producing the so-called 'blue tip' effect, or in the furrow.

In the course of the examination at the Berlin Milling Institute of 120 wheat samples of the 1935 harvest, 30 had to be rejected on account of bunt; of these 7, though emitting the familiar odour of trimethylamine [ibid., xiv, p. 432], failed to show on analysis the presence of bunt balls, which were detected, however, to the extent of up to 0·02, between 0·03 and 0·05, between 0·06 and 0·10, between 0·11 and 0·20, and above 0·2 per cent. in 9, 8, 2, 2, and 2 samples, respectively. Members of the Institute staff are of the opinion that the presence of three bunt balls (0·04 per cent.) per 100 gm. of seed-grain should not constitute a reason for a rebate in price, the same applying to 3 per cent. blue-tipped grains or to 2 per cent. blue tip and one bunt ball per 100 gm. A rebate should be made, however, where the samples reveal

4 to 10 bunt balls or 4 to 10 per cent. blue tip, and a proportionately larger one where the incidence of infection exceeds these figures.

MARCHIONATTO (J. B.). **Enfermedades del Trigo poco conocidas y radicadas en la región oeste de la zona triguera.** [Little known Wheat diseases indigenous to the western section of the Wheat-growing area.]—*Bol. Minist. Agric., B. Aires*, xxxvi, 4, pp. 293–299, 4 col. pl., 1934. [Received February, 1936.]

Among the fungi isolated from specimens of wheat affected by diseases of the foot-rot group in the Argentine since 1929 were *Gibberella saubinetii* from the roots, shoots, ears, and grain; *Helminthosporium sativum* from the roots, basal internodes, shoots, and once from the grains of Kubanka imported from the United States; *Ophiobolus graminis* from the foot region [*R.A.M.*, xii, p. 683]; and *Alternaria peglionii* [ibid., x, p. 21; xiii, p. 21] and *Fusarium moniliforme* var. *subglutinans* [*Gibberella fujikuroi* var. *subglutinans*: ibid., xiv, p. 427] from the grain. A map shows the distribution of the three first named in the provinces of Cordoba, Buenos Aires, La Pampa, and other wheat-growing centres. Notes are also given on the symptoms, modes of infection and perpetuation, and control of these fungi.

BUCHWALD (N. F.). **Undersøgelser over Bygrust (Puccinia hordei Otth).** [Investigations on Barley rust (*Puccinia hordei* Otth).]—Reprinted from *Beretn. Nord. JordbrForskn. Kongr. 1935*, 9 pp., 1935.

In 1865 Körnicke differentiated a variety *simplex* on barley of the collective species *Puccinia straminis* Fckl (previously named by De Candolle *P. rubigo-vera*) [*R.A.M.*, xiv, p. 746], but in 1894 Eriksson and Henning raised this varietal name to specific rank as *P. simplex*. In the meantime, however, the barley rust had been described at least three times as an independent species, viz., in 1871 by Otth as *P. hordei*, in 1875 by P. Nielsen as *Uromyces hordei*, and in 1878 by O. Rostrup, in a technical description of v. Thümen's exsiccata, as *P. anomala*. The last name has been generally accepted in the Danish literature as the correct designation of the barley rust, whereas *P. simplex* has been widely used abroad until recent years; at the present time a tendency to revert to the use of *P. anomala* is apparent. The name *P. simplex* is invalid both because it had been used by Peck in 1881 to describe an entirely different rust on *Geum*, and because it was employed by Körnicke only as a varietal and not as a specific name. The preference of Arthur for Rostrup's name appears to be based on a chronological error, the statement that Fuckel's designation, *P. hordei* on *Hordeum murinum*, was published in 1860 being refuted by a careful perusal of the relevant literature, which shows 1873 (Symb. myc., II Nachtrag) to have been the date of issue. According to the rules of nomenclature now in force, *P. hordei* Otth (1871) is the oldest and hence the correct name for the barley rust, while *P. hordei* Fckl (1873) appears to be a distinct species, and the writer proposes for it the name of *P. fuckelii*.

The teleutospores of *P. glumarum* are found more frequently on the sheaths than on the blades, and in very severe cases may occur on

the upper portions of the straw, the awns, and the grain. On the blades the stripes formed by the teleutosori are generally short and tend to amalgamate, whereas on the sheaths they may extend for a considerable length and appear never to converge; the latter are composed of irregular, spherical to oval, markedly convex spots, 0·1 to 0·5 mm. in diameter, those on the blades being narrower, more striate, often almost spindle-shaped. On the sheaths the teleutospores are dark to blackish-brown and very shiny, on the blades almost coal-black and duller.

The teleutospores of *P. hordei*, in contrast to those of *P. glumarum*, develop mostly on the leaf blades. Infection has occasionally been observed by the writer on the awns but never on the straw. The teleutospores are never arranged in definite striations but are scattered over the surface; on the blades they are punctiform, shortly linear or almost quadratic, often only 0·1 mm. in diameter, while on the sheaths they produce larger, oblong spots. The teleutospores of *P. hordei* are only slightly convex, greyish- to coal-black, and dull.

The examination of some 100 collections of *P. glumarum* and *P. hordei* (including Otth's original material of the latter) showed that the two species are distinguishable by the number of unicellular teleutospores (mesospores), which constituted 80·53 per cent. of the total in *P. hordei* as against only 9·97 per cent. in *P. glumarum*. In both species the length of the teleutospores is practically the same (about 50 μ), but in *P. glumarum* the terminal cell is always rather longer than its width, whereas in *P. hordei* these dimensions are approximately equal. The terminal and basal cells in *P. glumarum* are about the same length. On an average the teleutospores of *P. hordei* are wider by 4 to 5 μ than those of *P. glumarum*.

TAPKE (V. F.). **An effective and easily applied method of inoculating seed Barley with covered smut.**—*Phytopathology*, xxv, 11, pp. 1038–1039, 1935.

The study of physiologic specialization in *Ustilago hordei*, the agent of covered smut of barley [*R.A.M.*, vii, p. 560], has been greatly facilitated by the following comparatively simple and very effective method of seed-grain inoculation. Six-gram lots of seed are placed in $\frac{7}{8}\times 3$ in. shell vials, into which is poured a spore suspension (1 gm. spores thoroughly shaken in 1 l. water) until the fluid rises $\frac{3}{4}$ in. above the seed; this is vigorously shaken in the liquid for $\frac{1}{2}$ minute and left to soak for 15 minutes. The suspension is then decanted and the vials inverted on clean blotting-paper to absorb all free water prior to packing in a tightly covered tin box floored with a moistened blotter for 24 hours' incubation at 20° C., after which the seed is transferred to envelopes, left wide open, for two or three days' drying before sowing. In field plantings of spring and winter barleys in 1934 and 1935 up to 70 per cent. of smutted heads were obtained by this method.

TAPKE (V. F.). **A study of the cause of variability in response of Barley loose smut to control through seed treatment with surface disinfectants.**—*J. agric. Res.*, li, 6, pp. 491–508, 1 pl., 1 fig., 1935.

The author gives a tabulated account of further investigations, the results of which confirmed the wide distribution in the United States

and the considerable economic importance of *Ustilago nigra* [*R.A.M.*, xiii, p. 691; cf. also xiv, p. 353] on barley. This fungus resembles *U. nuda* in the emergence and appearance of smutted barley ears, the dissemination of spores during the heading and flowering period of the host, and in the fact that it can infect the latter through the flowers; it differs, however, in the mass colour (dark chocolate-brown) of its spores, and in that it may be controlled by treating the seed produced by infected flowers with certain surface disinfectants [loc. cit.]. The reported control of loose smut of barley by this method [ibid., ix, p. 517; xi, p. 567] is explicable on this basis. Furthermore, on 2 per cent. potato dextrose agar at 70° F. the spores of *U. nigra* germinate by producing a promycelium bearing typically four lateral sporidia, while under the same conditions no sporidia are formed by *U. nuda*, and *U. nigra* may also produce smutted plants by infection of the seedlings raised from seed inoculated when mature. The work also showed that some of the most important barley varieties in the United States are highly susceptible to *U. nigra*. To facilitate distinction, the terms 'brown' and 'black' loose smut of barley are suggested for *U. nuda* and *U. nigra*, respectively.

Der Kronenrost des Hafers (Puccinia coronifera). [Crown rust of Oats (*Puccinia coronifera*).]—*Dtsch. landw. Pr.*, lxii, 47, p. 572, 1935.

Crown rust of oats (*Puccinia coronifera*) [*P. lolii*], stated to be ordinarily of little or no importance in Schleswig-Holstein [*R.A.M.*, xiii, p. 428], developed in an extremely severe form in various parts of that province at the end of July, 1935. The reddish-brown uredospores of the rust were produced in such numbers that at harvesting dense clouds of spore dust enveloped the workers, horses, and machinery, and settled as a thick reddish crust on the ground. According to a member of the Kiel Plant Protection Headquarters, the alternate host of the rust, *Rhamnus cathartica*, bore a profusion of aecidia, which were presumably responsible for this very unusual outbreak of the disease. The yields were not appreciably reduced and no special control measures are considered to be necessary, since the meteorological conditions predisposing to infection are unlikely to recur frequently. Diseased material should not be used for fodder.

IVANOFF (S. S.). **Studies on the host range of Phytomonas stewarti and P. vascularum.**—*Phytopathology*, xxv, 11, pp. 992–1002, 3 figs., 1935.

The host range of *Phytomonas* [*Aplanobacter*] *stewarti* [*R.A.M.*, xv, p. 12] and *P.* [*Bacterium*] *vascularum* [ibid., xiv, p. 531] was investigated in a series of greenhouse and field inoculations on sorghum, sugar-cane, Sudan grass (*Holcus sudanensis*) [*Sorghum sudanense*], *Setaria glauca*, *S. italica* var. *stramineofructa*, and *Panicum miliaceum*.

Some common resemblances were observed between the symptoms induced on all the hosts by both pathogens, together with certain differential features varying with the plants. The similarities included the formation of stripes along the veins in the manner characteristic of *A. stewarti* [ibid., xiii, p. 298], the development of semicircular or irregular areas on either side of the vein, the colour and consistency

depending on the host, and a general discoloration of the green parenchymatous tissue adjoining the affected portions. The differences are connected chiefly with the colour of the veins and of the contiguous areas and with the consistency and distribution of the latter, besides variations in the length of the incubation period, which in the case of maize inoculated in the greenhouse, for instance, was twice as long for *Bact. vascularum* as for *A. stewarti*. In the case of maize, *S. glauca*, *S. italica* var. *stramineofructa*, and *P. miliaceum* inoculated with *A. stewarti* the affected veins and adjacent areas were tan to light brown, while in those of sorghum and Sudan grass they were red. The colour of the same infected tissues in plants inoculated with *Bact. vascularum* was light brown to rusty in maize and red in sorghum. All the light brown areas (in contrast to the red) in each host, irrespective of the pathogen, were water-soaked at first, later becoming necrotic and dry. Rotting of the maize and sorghum stalk tissues was induced by both pathogens, *A. stewarti* causing a pale discoloration and *Bact. vascularum* a deeper tinge on sorghum while no striking differences were observed on maize.

The 25 sugar-cane (Co. 281 and C.P. 807) seedlings inoculated with *A. stewarti* failed to contract infection, but this negative result is not considered to be necessarily conclusive. The Kansas Orange sorgo variety of sorghum showed a high degree of resistance to *A. stewarti* in the field. *Bact. vascularum* was responsible for cavities in the stalks of Roxorange sorghum as well as in those of Golden Gem (sweet) and Leaming (field) maize.

WINSTON (J. R.). **Reducing decay in Citrus fruits with borax.**—*Tech. Bull. U.S. Dep. Agric.* 488, 32 pp., 7 figs., 14 graphs, 1935.

The common stem-end rots (*Diplodia natalensis* and *Diaporthe citri*) and the green and blue moulds (*Penicillium digitatum* and *P. italicum*) of citrus (orange, tangerine, lemon, and grapefruit) have been found to yield in Florida to a bath containing not less than 8 per cent. borax, in which the fruits should be immersed immediately on arrival at the packing-house [*R.A.M.*, xiii, p. 763]. The treatment was equally effective on fruit requiring colouring and on that already fully coloured on harvesting, but firm fruits responded much more readily than those that were over-ripe and about to drop from the trees. The wet fruits should be dried slowly and the borax residue left on them for several hours. In cold weather the temperature of the rind should be raised to about 90° F. before applying the treatment either by warming the fruit in the colouring rooms or by slow passage through long tanks with heated borax solution. In well-organized packing-houses the cost of this treatment has not exceeded $\frac{1}{2}$ to $\frac{2}{3}$ cent per 100 lb. fruit, and its value is reflected by a reduction of the incidence of decay in transit and in improved keeping quality on arrival at the market and in the hands of the retailer and consumer.

REINBOTH (G.). **Genossenschaftskrankheitsbekämpfung und die Zitronenproduktion.** [Co-operative disease control and Lemon production.]—*Z. PflKrankh.*, xlv, 11, pp. 550–554, 1935.

During the period from 1931 to 1933 the abundant lemon harvests

in Sicily, together with the collapse of the calcium citrate industry, resulted in a slump which deprived the local growers of all possibility of contributing to the co-operative disease control organizations. Excellent work has been done by these bodies since the middle years of the last decade, when they were initiated primarily to combat a formidable scale insect and 'mal secco' [*Deuterophoma tracheiphila*: *R.A.M.*, xii, pp. 256, 565 and next abstract], but even with the aid of a Government subsidy of 3,000,000 lire, allotted in 1933, the experts have so far been unable to stem the ravages of the disease, which reduced the 1934–5 harvest to a quarter of the normal. The offer by the phytopathological administration of a reward for the discovery of a means of control has not yet yielded any tangible result.

A brief note (pp. 554–555) on the symptoms and etiology of 'mal secco', based on Petri's researches, by Prof. v. Tubeuf is appended.

CASELLA (D.). **Le malattie degli Agrumi e lo stato attuale dei rimedi relativi.** [Citrus diseases and the present state of the appropriate treatments.]—*Ann. Staz. Agrum. Frutt. Acireale*, N.S., ii, pp. 239–253, 1935.

Notes are given on the symptoms and control of the chief fungal diseases affecting citrus in Sicily.

Rhizoctonia root rot [*Corticium solani*: *R.A.M.*, xii, p. 214] of nursery seedlings is favoured by excessive soil humidity. Root rot due to unfavourable soil conditions is associated with: *Armillaria mellea*, *Sclerotinia libertiana* [*S. sclerotiorum*], *Rosellinia pepo*, *Fusarium* spp., *Phytophthora citrophthora*, and *P. parasitica* [ibid., ix, p. 302]. Gummosis, caused by *P. citrophthora* or *P. terrestris* [*P. parasitica*: ibid., xv, p. 90], attacks the following hosts (arranged in decreasing order of resistance): bitter orange [*Citrus aurantium* var. *bigaradia*], *Poncirus* [*trifoliata*], grapefruit, rough or Florida lemon, mandarin, sweet orange, lemon, and lime. *P. citrophthora* is particularly injurious to lemon, and *P. parasitica* to sweet orange; the former fungus is favoured by a temperature of 20°, the latter by one of 30° C.

Mal secco (*Deuterophoma tracheiphila*) [see preceding abstract] infection is stated to be reducible by the prompt removal and destruction of the affected parts and the disinfection of the wounds left at the end of August and the beginning of February, and a special commission has been appointed in Sicily to supervise this work. In preliminary tests very promising results were given by applications to affected lemon trees of 100 gm. manganese dioxide and 2 kg. slaked lime per tree, this treatment arresting the spread of the disease or greatly retarding death; it did not, however, prevent new infections. The best times for making the applications (which should be repeated every two years) were in January and February and August and September. Attempts to find resistant varieties of lemon [ibid., xiv, p. 680] showed that the Meyer lemon may prove very satisfactory for hybridization purposes.

THOROLD (C. A.). **Progress report on Elgon dieback of Coffee.**—*E. Afr. agric. J.*, i, 3, pp. 225–228, 1935.

Coffee growing on Mount Elgon, Kenya, is widely affected by a con-

dition referred to as 'Elgon die-back' [*R.A.M.*, xiv, p. 426]. This affects almost any leafy part, from a small secondary or tertiary branch to a whole sucker or a large part of the top. Usually all or part of a primary branch wilts, later turning brown and black. Die-back sets in and slowly spreads, generally becoming arrested at the junction of the branch with the main stem. In some seasons the earliest visible stages are accompanied by blackening. One or more nodes or internodes may be discoloured, and the base of the leaf turns black. The symptoms vary greatly according to the individual tree and the season of the year.

The condition is associated with species of *Phoma* (frequent), *Phomopsis*, *Diplodia* (infrequent), *Colletotrichum* (rare), (?) *Sphaeropsis*, and other fungi, while bacteria were sometimes present. Inoculations with pure cultures of the more commonly occurring organisms gave negative results and the die-back is thought probably to be of physiological origin.

Prevalence is greatest on exposed slopes and least on trees provided with sufficient shade. The disease is generally absent from or rare in localities where coffee berry disease [*Colletotrichum coffeanum*: ibid., xiii, p. 367; xiv, p. 32] is present, the optimum conditions for the development of the two diseases being directly opposed. Vigorous trees in relatively good health are affected, the worst features, however, occurring on already debilitated trees, on which the loss of suckers and primary branches may seriously reduce the yield, which otherwise is unaffected. Some trees, particularly a copper-tip type present to the extent of about 10 per cent. in French Mission coffee, appear to be highly resistant.

The only methods of control that can be recommended at present are the use of resistant trees (with loss of quality in the coffee) or shade. Further investigations are in progress.

[This paper also appears in *Mon. Bull. Coffee Bd Kenya*, i, 10, pp. 10–11, 1935.]

Rolfs (F. M.). **Dissemination of the bacterial leaf spot organism.**—Abs. in *Phytopathology*, xxv, 10, p. 971, 1935.

Seed has been found to be the source of both primary and secondary infection of the cotton crop by *Bacterium malvacearum*. Internal seed infection [*R.A.M.*, ix, p. 377; x, p. 661; xii, p. 141] may occur either directly while the boll is quite young, or indirectly by the entry of contaminated water through a break in the outer seed coat of mature seed at the micropyle.

Water is an important agent of dissemination. The bacteria were carried 980 ft. in rill water. The green leaf bacteria are capable of independent movement over a radius of 12 in. or more in still water. The age limit of free bacteria in distilled water is about 60 hours. The life of the organisms is shortened by soluble soil salts in contaminated pool water. The more exposed parenchyma infections tend to be eliminated by hot, dry weather, the leaf spots becoming less angular and vascular invasion developing more prominently. The accumulation of the bacteria in the veins and midrib hastens leaf-shedding and affords better protection for the parasite from adverse weather conditions.

Wind also plays an active part in dissemination. A single whirlwind scattered the infected dry leaf material over an area of 100 acres in 20 minutes.

AZEVEDO (N.). **Nota sobre o 'Diplodia' do Algodoeiro.** [A note on Cotton '*Diplodia*'.]—*Rodriguésia*, i, 2, pp. 97–98, 1 fig., 1935.

In 1933 cotton growing in experimental plots in Rio Janeiro was found to show varying degrees of boll infection by a *Diplodia* with the characters of *D. gossypina* [*R.A.M.*, x, pp. 96, 240; xii, p. 366], not previously recorded on cotton bolls in Brazil.

SCHWARTZ (W.). **Untersuchungen über die Symbiose von Tieren mit Pilzen und Bakterien.** [Studies on the symbiosis of animals with fungi and bacteria.]—*Arch. Mikrobiol.*, vi, 4, pp. 369–460, 1935.

A comprehensive summary, supplemented by a five-page bibliography, is given of the investigations hitherto accomplished on the problem of symbiosis between insects and fungi or bacteria [*R.A.M.*, xiv, p. 306 and next abstract].

Extreme difficulty is experienced in obtaining pure cultures of the endosymbiotic micro-organisms owing to the high degree of adaptability of the majority of the fungi and bacteria concerned to their hosts. In cases where successful results have been obtained the symbionts were found to represent widespread groups of fungi and bacteria of a primarily saprophytic habit of life. There would seem to be no basis for the belief in 'mutualism', connoting a capacity in the host for the selection of such symbionts as will promote its vital functions. On the contrary, endosymbiosis between insects and vegetable forms of life may be regarded as a stage in which the symbiont assumes the rôle of a harmless parasite. In some cases there may be an inversion of the parasitic relationship whereby the symbiont becomes indispensable to the host.

RIES (E.). **Über den Sinn der erblichen Insektensymbiose.** [On the significance of hereditary insect symbiosis.]—*Naturwissenschaften*, xxiii, 44, pp. 744–749, 2 figs., 1935.

On the basis of his own investigations and those of others the writer summarizes the present position in regard to the knowledge of hereditary symbiosis between insects and fungi or bacteria [see preceding abstract]. To the category of hereditary symbiosis are considered to belong all partnerships characterized by specialized organs, regular occurrence, and transmission to the progeny. From an experimental analysis of the uses of the connexion arises a further division into mutual and helotistic symbiosis, the former implying the existence of advantages on both sides while the latter denotes that the symbiont is completely in the power of the host, which simply allows it to degenerate when no longer of use; yet another aspect of the relationship is that of parasitism or commensalism, in which the symbiont parasitizes the host without conferring any benefit in return, or remains within the insect after its nutritional functions are exhausted.

Benatar (R.). Fungos entomogenos dos Citrus. [Entomogenous fungi of Citrus.]—*Rodriguésia*, i, 2, pp. 7–10, 1 fig., 1935.

Brief, popular notes are given on the following entomogenous fungi found on citrus in Brazil, viz., *Aschersonia aleyrodis* [*R.A.M.*, xii, p. 568; xiii, p. 698], which is very commonly parasitic on Aleyrodidae on orange leaves, *A. goldiana* [ibid., vi, p. 419], which chiefly attacks *Dialeurodes citrifolii*, *A. turbinata* [loc. cit.], which attacks coccids, *Sphaerostilbe aurantiicola* [loc. cit.], *S. flammea*, *S. coccidophthora* [ibid., x, p. 708; xii, p. 144], *Podonectria coccicola* [ibid., xiv, p. 98], *Myriangium duriaei* [loc. cit.] and a *Septobasidium*, at present considered to be *S. albidum* [ibid., xiii, p. 90], which is abundantly present in most citrus plantations in Brazil and may cause considerable damage by infecting large areas of the surface of the fruit near the peduncle.

Report of Proceedings of the inter-State Locust Conference, Pretoria, 30th July to 3rd August, 1934.—Issued by *Dep. Agric. For. S. Afr.*, 116 pp., 5 pl., 4 figs., 14 maps, 1935.

In this report the following references of mycological interest are made. In May [? 1934] great numbers of red locusts (*Locusta migratoria migratorioides*) were killed off by disease in the Massa and Mozambique districts of Portuguese East Africa, and *Empusa grylli* [*R.A.M.*, xiv, p. 427] was identified in the bodies of the dead insects. At about the same date an epidemic causing a high mortality among red locusts was reported from Quelimane's District; of four insects which reached the insectary alive after dispatch from the area concerned one died after two, two after five, and the fourth after eleven days. The dead insects showed the presence of a fungus agreeing with the description of *Sporotrichum paranense* [ibid., xiv, p. 98]. Two locusts inoculated with spores of the fungus developed a marked red coloration and died in seven days. A few hours after death the head, femur, hind legs, and pronotum turned white and the internal organs green, all these parts showing the presence of the fungus.

In the Union of South Africa *E. grylli* was certainly present in various parts of the north, and in Natal and Zululand, while it was reported from the vicinity of Pretoria. Almost invariably, however, its effects in controlling the locusts were disappointing, well under 10 per cent. of the insects being attacked, as a rule, in any locality. In Southern Rhodesia, on the other hand, large numbers of locusts were killed by the fungus. In Northern Rhodesia it is stated to have cleared the area where it first appeared in February from locusts; it spread to an astonishing extent in March, and in the west wiped out the young bands of insects; it destroyed many young flying swarms, and in April and May accounted for most of the remaining locusts in most localities. In Tanganyika *E. grylli* is so active among the locusts that local workers doubt the wisdom of killing swarms where the disease is present; the fungus also attacks grasshoppers in that country.

E. grylli is regarded as the most important enemy of the red locust in the regions referred to above and the conference considered it desirable that further research on all aspects of the disease should be undertaken.

Patay (R.). **Sur un champignon parasite du Doryphore (Leptinotarsa decemlineata Say).** [On a parasitic fungus of the Colorado Beetle (*Leptinotarsa decemlineata* Say).]—*Bull. Soc. sci. Bretagne*, xii, 1–2, pp. 62–66, 3 figs., 1935.

Beauveria doryphorae [*R.A.M.*, xiv, p. 507], found parasitizing adults of the Colorado beetle (*Leptinotarsa decemlineata*) bred in the laboratory at the Faculty of Sciences, Rennes, in 1934, is stated to differ in the absence of pigmentation in culture from the related entomophytes, *Spicaria* (*Isaria*) *farinosa* [ibid., xiii, p. 574], *B. globulifera* [ibid., xiii, p. 302], *B. densa* [ibid., xi, p. 179], *B. bassiana* [ibid., xv, p. 150], and *B. effusa* [ibid., v, p. 96], the colonies of which are chamois- to lemon-yellow, yellowish-green, red, bright red (on potato), and flocculent and red (potato), respectively.

Both in the imago and larval stages the insects contracted the disease while in full activity and rapidly succumbed; those experimentally sprayed with conidia failed to reach maturity. The onset of infection was nearly always marked by the development of a black spot on the cuticle. The exact mode of infection was not determined, but it was shown to be systemic and to meet with very little resistance. Contamination of the nymphs proved to be difficult and that of the eggs impracticable. It is evident that this disease is quite distinct from that described by Dieuzeide as attacking hibernating imagos of *L. decemlineata* but sparing the adults. Large-scale experiments are necessary to determine the value of *B. doryphorae* as an agent in the control of the pest.

Hendee (Esther C.). **The rôle of fungi in the diet of the common damp-wood termite, Zootermopsis angusticollis.**—*Hilgardia*, ix, 10, pp. 499–525, 8 graphs, 1935.

In this expanded account of the author's experiments in feeding termites (*Zootermopsis angusticollis*) on fungus-containing and fungus-free diets, a condensed version of which has already been noticed from another source [*R.A.M.*, xiv, p. 166], it is stated that the inadequacy of fungus-free filter paper as a diet was demonstrated by the failure of individually isolated termites to make significant gain in dry weight and by the high mortality, great loss in group weight, and low gain in average weight in groups of termites on a diet of filter paper, as compared with those on their natural diet of rotten wood. The data obtained indicate that the fungi probably supply vitamins essential to the normal growth and development of the insects.

Maurizio (Anna). **Beiträge zur Kenntnis der Pilzflora im Bienenstock. I. Die Pericystis-Infektion der Bienenlarven.** [Contributions to the knowledge of the fungus flora of the beehive. I. *Pericystis* infection of Bee larvae.]—*Ber. schweiz. bot. Ges.*, xliv, pp. 133–156, 2 pl., 7 figs., 5 graphs, 1935.

Further researches on the so-called 'chalk brood' disease of bees, whereby the larvae are converted into white, calcified mummies, and its causal organism (*Pericystis apis*) [*R.A.M.*, ix, p. 524] are fully described. The disturbance appears to be spreading throughout

Switzerland. The heterothallic fungus was found to occur in the honeycombs in two different forms, experiments in the crossing of which have so far given negative results. One is the form (herein referred to as 'small-fruited') originally described by Claussen (*Arb. biol. Reichsanst. Land- u. Forstw.*, x, [p. 467], 1921), while the other ('large-fruited') seems to be a new development. Both were carefully studied in cultures on beerwort agar and the development of the fruit bodies from antheridia and oogonia investigated in detail. In both forms the oogonia become dark brown and the contents divide into a number of spore balls but whereas the large type of fruit body is spherical, piriform, or oval when ripe, the small type is regularly spherical. The average dimensions of the large fruit bodies were found to be $128{\cdot}44 \pm 0{\cdot}80\ \mu$ compared with $65{\cdot}84 \pm 0{\cdot}51\ \mu$ for the small type. The optimum temperature for the growth of both forms is about 30° C., but the large-fruited makes better progress than the small at lower temperatures. In the small-fruited form the male mycelium grows more rapidly than the female, a difference that was not observed in the large type. Fruit body formation reached a maximum in the large-fruited form at 20° and in the small one at 30°. A tendency to sterility is much more pronounced in the large-fruited form than in the small one, especially at high temperatures. Both types of *P. apis* induced strong fermentation of levulose, dextrose, galactose, and maltose, while the small one also utilized saccharose and lactose; starch was more extensively decomposed by the small than by the large form. In spite of the differences manifest between the two forms, no specific distinction between them is made pending further studies on the biology of the new type and its part in the etiology of 'chalk brood'.

CORTELLA (E.). **Sopra un particolare caso di erosioni degli spazi interdigitali dei piedi da simbiosi schizosaccaromycetica.** [On a peculiar case of erosions of the interdigital spaces of the feet due to Schizosaccharomycetous symbiosis.]—*Boll. Sez. reg.* (*Suppl. G. ital. Derm. Sif.*), xiv, 4, pp. 352–358, 1935.

The writer describes and discusses a localized eruption of the interdigital spaces on the feet of a 28-year-old naval officer; in which a *Staphylococcus*, a *Cryptococcus* (determined by Prof. Nannizzi) with oval conidia 3 to 5 by 2·5 or 3·5 to 4 by 2·5 μ, and chlamydospores, 4 to 4·5 by 3 μ, and *Trichophyton acuminatum* [*R.A.M.*, xiii, pp. 237, 768, and next abstract] were implicated. In the case of the first two true symbiosis was definitely indicated, whereas the last is believed to have been an accidental contaminant.

CRAWFORD-JONES (C.). **Dermatomycosis in the army.**—*J. R. Army med. Cps*, lxv, 5, pp. 306–316, 1935.

A summary is given of the author's clinical, etiological, diagnostic, and prophylactic observations on various common forms of dermatomycosis, associated primarily with *Microsporon audouini*, *M. lanosum*, *Trichophyton crateriforme*, *T. acuminatum* [see preceding abstract], *T. violaceum*, *T. cerebriforme*, *T. plicatile*, *T. asteroides* (*gypseum* group), *T. mentagrophytes* [*R.A.M.*, xv, p. 92], *T. radians* (*niveum* group) [ibid.,

xiv, p. 101], *T. rosaceum*, and *T. ochraceum*, which are stated to be greatly increasing in prevalence in the British army.

HRUSZEK (H.). **Über die Pilzflora der Tübinger Gegend.** [On the fungous flora of the Tübingen district.]—*Derm. Wschr.*, ci, 48, pp. 1506–1512, 1935.

A tabulated account is given of the writer's studies on dermatomycoses in the Tübingen district of Germany from June, 1934 to July, 1935, from which it appears that out of 49 cases of ringworm (excluding those affecting the hands and feet) *Trichophyton gypseum asteroides* [*T. mentagrophytes*: see preceding and next abstracts] was responsible for 28, yeasts for 10, and miscellaneous species of *T.*, *Achorion*, *Acremonium*, and *Epidermophyton* for the remainder. Of the 69 cases of ringworm of the hands and feet, 33 were caused by *E.* Kaufmann-Wolf [ibid., xv, p. 151], 24 by yeasts, and the rest by various species of the above-mentioned genera and *Cephalosporium*. A summary is given of the clinical observations in a few cases of special interest.

CARRIÓN (A. L.). **Observations on dermatomycosis in Puerto Rico.**—*Puerto Rico J. publ. Hlth*, x, 3, pp. 255–261, 7 pl., 1935. [Spanish translation, pp. 263–269.]

Trichophyton rubrum [*R.A.M.*, xiv, pp. 632, 695] would appear, from the writer's laboratory studies on 150 cases of tinea cruris in Porto Rico, to be the only fungus related to the disorder in question on the Island. Tinea of the feet, however, seems to be associated with at least three different species, viz., *T. rubrum*, *T. mentagrophytes* [see preceding abstracts], and *Epidermophyton floccosum* [ibid., xiv, p. 759]. Two strains of the last-named, differing in certain cultural characters on Sabouraud's medium, were isolated from the affected parts in two cases, both in young men, of tinea of the feet. In one case the hand, the finger-nails, and the toe-nails, were involved, this being apparently the first record of *E. floccosum* causing nail infection. Another interesting feature of this case was the simultaneous presence in the nails of *T. rubrum*.

CARRIÓN (A. L.). **Chromoblastomycosis. Preliminary report on a new clinical type of the disease caused by Hormodendrum compactum, nov. sp.**—*Puerto Rico J. publ. Hlth*, x, 4, pp. 543–545, 1 pl., 1935. [Spanish translation, pp. 546–548.]

Six cases of chromoblastomycosis have been investigated in Porto Rico since 1931, the source of infection in four being *Hormodendrum* [*Trichosporium*] *pedrosoi* [*R.A.M.*, xiv, p. 509], in one undetermined, and in the remaining patient, a 50-year-old agricultural labourer, due to a new species, *H. compactum* [see next abstract]. The fungus forms scanty, dark olive colonies on Czapek's solution agar and grows slowly on Sabouraud's maltose agar. The hyphae measure 2·5 to 5·2 μ in diameter and occasionally tend to branch dichotomously at the tips; the olivaceous, erect or ascending conidiophores, poorly differentiated from the vegetative hyphae, bear at their apices compact groups of smooth, olivaceous, subspherical, concatenate conidia, 2·5 to 4·8 by

2·5 to 3·8 μ, the basal element in the spore chain measuring 3·8 to 6 by 3 to 4·5 μ, each conidium being capable of bearing secondary spores at the tip, laterally, or basipetally.

Carrión (A. L.) & Emmons (C. W.). **A spore form common to three etiologic agents of chromoblastomycosis.**—*Puerto Rico J. publ. Hlth*, xi, 1, pp. 114–115, 1935. [Spanish translation, pp. 116–117.]

Three fungi, indistinguishable *in vivo* but very different in culture, are known as agents of chromoblastomycosis. In *Phialophora verrucosa* [*R.A.M.*, xiv, p. 509], small, oval spores are successively budded out in the cup-like mouth of a flask-shaped conidiophore. In *Hormodendrum* [*Trichosporium*] *pedrosoi* [see preceding abstract] larger, oval conidia are borne in branching chains on simple or branched conidiophores, and in acropleurogenous arrangement at the tips of simple conidiophores. In *H. compactum* [loc. cit.] subspherical conidia are borne in branching chains on simple or branched conidiophores.

In one strain of *T. pedrosoi* the writers recently found, in addition to abundant *Hormodendrum* conidia, a few conidiophores and conidia of the *Phialophora* type. The subsequent examination of four Porto Rican and two South American strains of *T. pedrosoi*, and of the one described strain of *H. compactum*, revealed occasional sporulation of this type in all, thereby affording unmistakable evidence of a close relationship between three well-differentiated species now distributed in two remote genera.

Franchi (F.). **Lesioni cutanee da Cephalosporium acremonium Corda.** [Cutaneous lesions caused by *Cephalosporium acremonium* Corda.] —*Boll. Sez. reg.* (*Suppl. G. ital. Derm. Sif.*), xiv, 4, p. 405, 1935.

A fungus identified by Prof. Pollacci as *Cephalosporium acremonium* [*R.A.M.*, xiv, p. 695] was isolated from abscesses on the body and extremities of a 42-year-old peasant woman. The fungus (a plant parasite) [ibid., xiv, p. 405] is believed to have spread upwards from the left foot, where the first symptoms of the trouble were experienced. Positive results were given by the subcutaneous inoculation of a mouse with a spore suspension of the fungus, which was recovered in pure culture from the lesions thus induced.

Ferrari (A. V.). **Sopra un caso di haplografiosi.** [On a case of haplographiosis.]—*Boll. Sez. reg.* (*Suppl. G. ital. Derm. Sif.*), xiv, 4, pp. 395–397, 1 pl., 1935.

The fungus isolated from the dry, erythemato-squamous lesions on the palm of the hand of a female patient was characterized on Sabouraud's medium by greyish-white colonies, successively turning greenish, dark grey, and inky-black, by branched, septate, hyaline, later dark hyphae, and simple, erect, septate conidiophores, bearing at the apices sterigmata with lemon-shaped, concatenate conidia. It was identified by Prof. Pollacci as *Haplographium de bellae marengoi* [*R.A.M.*, xiii, p. 30]. The case is considered to be of some interest, not only by virtue of the rarity of the fungus, but also on account of the superficial nature of the lesions induced, resembling those of the epidermomycoses.

Kobayasi (T.). **Beiträge zur experimentellen Sporotrichose. I. Mitteilung: Impfversuche mit Sp. beurmanni (Stamm von Kobayasi) an weissen Ratten und Kaninchen.** [Contributions to the knowledge of experimental sporotrichosis. Note I: inoculation experiments with *Sporotrichum beurmanni* (Kobayasi's strain) on white rats and rabbits.]—*Jap. J. Derm. Urol.*, xxxviii, 5, pp. 747–770, 7 figs., 1935. [Japanese, with German summary on pp. 107–109.]

Clinical details are given of the writer's inoculation experiments on white rats and rabbits with a strain of *Sporotrichum beurmanni* previously isolated from one of his patients [*R.A.M.*, xiv, p. 309]. In the lesions thus induced the fungus appeared in the form of globular or oval elements, 2 to 3 μ in diameter, with a strongly refractive capsule. The fungus was recovered in every case from the experimental material.

Stiles (G. W.) & Davis (C. L.). **A case of bovine coccidioidal granuloma from the southwest.**—*J. Amer. vet. med. Ass.*, lxxxvii, 5, pp. 582–585, 3 figs., 1935.

Spherical, double-contoured bodies, 10 to 40 μ in diameter, were isolated from an abscess of the posterior mediastinal lymph-gland in a Hereford steer at Denver, Colorado, in 1935, and transferred after 48 hours' incubation at 37° C. to meat infusion agar, on which a white, cottony growth composed of long, septate, branching hyphae developed. The fungus was identified as *Coccidioides immitis* [*R.A.M.*, xiv, p. 759], of which there is believed to be only one previous record in the State [ibid., xii, p. 692].

Negroni (P.). **La cápsula de la Mycotorula albicans (Ch. Robin, 1853).** [The capsule of *Mycotorula albicans* (Ch. Robin, 1853).]—*Rev. Inst. bact., B. Aires*, vi, 5, pp. 671–676, 1 fig., 1935. [French and English summaries.]

The writer describes the capsule of the thrush fungus (*Mycotorula* [*Candida*] *albicans*) [*R.A.M.*, xv, p. 152 and next abstract], of which this is stated to be the first record. It is most conspicuous in 15-hour-old cultures on glucose, maltose, and levulose, incubated at 37° C. and stained by Huntoon's method (*J. Bact.*, ii, p. 241, 1917). The capsule resists repeated washings with borate and sodium bicarbonate solutions, boiling in water, and two hours' shaking with glass beads, and also withstands the action of 0·5 per cent. formol and alcohol-acetate. It is almost entirely disintegrated, however, by 1 to 2 per cent. sodium hydroxide, especially after boiling. The capsule is formed in culture media at a P_H range of 6·5 to 8·5.

Schlutz (F. W.). **Systemic thrush in childhood.**—*J. Amer. med. Ass.*, cv, 9, pp. 650–653, 1935.

Full clinical details are given of four cases, three of which were fatal, of systemic thrush (associated with *Oidium* [*Candida*] *albicans*) [see preceding abstract] in female children, ranging in age from four months to eight years. Unusual features of the cases under discussion are dwarfing in two, generalized alopecia in three, and rapid sepsis in one (the infant), and all are of interest as illustrating the formidable nature

of the disorder when it assumes a systemic form and the poor results of any kind of treatment.

ROBINSON (G. H.) & GRAUER (R. C.). **Use of autogenous fungus extracts in the treatment of mycotic infections.**—*Arch. Derm. Syph., Chicago,* xxxii, 5, pp. 787–794, 1935.

A report is given on the successful treatment of a number of persons suffering from mycotic infections (*Aspergillus, Trichophyton, Penicillium, Sporothrix,* and *Mucor* spp.) by autogenous extracts [cf. *R.A.M.*, xv, p. 93], the preparation of which is described. Stock extracts from *T. niveum, Microsporon villosum,* and *M. audouini* may be applied with satisfactory results where autogenous vaccines are unobtainable. One of the cases treated with an autogenous vaccine was that of a pulmonary infection due to *A. fumigatus* [ibid., xii, p. 289] in which a complete cure was effected.

SAWERS (W. C.) & THOMSON (E. F.). **Torulosis, with a report of a case of meningitis due to Torula histolytica.**—*Med. J. Aust.*, xxii (ii), 17, pp. 581–593, 6 figs., 1935.

Following a concise but comprehensive introductory survey of the literature on torulosis (believed to comprise 49 cases, mostly from America, up to December, 1934), and the classification, bacteriology, clinical manifestations, pathology, and other features of *Torula histolytica* [*Torulopsis neoformans* or *Cryptococcus hominis*: *R.A.M.*, xv, p. 153], the writers give full details of a fatal case of this disease (the fifth recorded for Australia) in a 26-year-old woman.

The organism isolated from the cerebro-spinal fluid was Gram-positive, ovoid or spherical, of typical yeast-like appearance, and forming true buds, often attached to small, lateral stalks. Cultures were readily obtained on a number of standard media at 37° C. and room temperature. The fungus produced acid from dextrose, levulose, sucrose, galactose, arabinose, and mannose, with small amounts from sorbite. There was no sign either of ascospores or mycelium. It was shown by laboratory experiments to be pathogenic to mice, rats, and (to a limited extent) to monkeys (*Macacus rhesus*), the symptoms induced being those of septicaemia.

A bibliography of 56 titles is appended.

NIÑO (F. L.). **Blastomicosis humana generalizada por Cryptococcus (n.sp.). (Estudio clínico, parasitológico, anatomopatológico y experimental.)** [Generalized human blastomycosis caused by *Cryptococcus* (n.sp.). (A clinical, parasitological, anatomopathological, and experimental study.)]—*Monogr. Univ. B. Aires Mis. Estud. Pat. reg. Argent.* 3, 162 pp., 13 pl. (12 col.), 125 figs., 7 graphs, 1934. [Received February, 1936.]

An exhaustive account, supplemented by a bibliography of 110 titles, is given of the writer's clinical, morphological, taxonomic, and physiological studies on, and animal inoculation experiments with *Cryptococcus psichrophylicus* n.sp., the agent of a fatal case of generalized

blastomycosis in a 60-year-old male of Spanish extraction, a preliminary note on which has already appeared [*R.A.M.*, xi, p. 644].

In the pus of the subcutaneous abscesses the organism occurred either singly or in groups of 2 to 4 spherical elements of very variable diameter (7 to 30 μ), and completely enveloped in a gelatinous, hyaline, double-contoured capsule 5 μ or more in thickness. In young cultures on solid or liquid media the organism measured 3 to 7 μ in diameter and was devoid of the capsule; it presented a typically yeast-like appearance and (under these conditions but not *in vivo*) stained readily by the Gram and May-Grünwald-Giemsa methods. The optimum temperature for the development of the fungus lies between 20° and 25° C.; it was destroyed at 37° but survived in the refrigerator at 10° and even on ice at 2°. On Sabouraud's agar the colonies are creamy-white, hemispherical, moist, and non-adherent; gelatine is not liquefied nor milk coagulated. No trace of hyphal formation could be detected on any of the media recognized as specially appropriate for this purpose, neither were asci produced. The fungus utilized maltose, glucose, arabinose, levulose, and galactose without gas production.

Two types of lesions may be induced by *C. psichrophylicus* both on man and as a result of inoculation experiments on laboratory animals, namely, specific inflammatory processes, and areas of intense histolysis. In all probability the pathogen is transported through the blood stream. As in the case of other blastomycoses the manifestations of *C. psichrophylicus* are both visceral and cutaneous.

Dragišić (B.) & Varićak (B.). **Vergleichende Untersuchungen über die toxische Wirkung des wässerigen Extrakts aus Ustilago maidis und der Mutterkornpräparate.** [Comparative investigations on the toxic action of the aqueous extract of *Ustilago maydis* and that of the ergot preparations.]—*Arch. exp. Path. Pharmak.*, clxxix, 3, pp. 319–326, 1 fig., 1935.

On the basis of comparative feeding experiments on mice with an aqueous extract of *Ustilago maydis* [*U. zeae*: *R.A.M.*, xv, p. 12] (Jugo-Slavian spore material, six months old) and commercial preparations of rye ergot [*Claviceps purpurea*: ibid., xv, p. 154], the writers conclude that the former is a great deal more toxic than ergotamine tartrate and ergotin Merck. The general similarity of the symptoms induced by the two substances point to the presence in the maize smut material of very large quantities of ergotamine-like substances. These results are considered to be of importance in relation to the etiology of juvenile acrodynia, in which *Ustilago* poisoning is believed in certain quarters to play a part.

Fabian (F. W.) & Severens (J. W.). **Moldiness in Romano Cheese.**—*J. Dairy Sci.*, xviii, 11, pp. 773–775, 1935.

Penicillium italicum was isolated from samples of Romano cheese prepared at a Michigan factory by a special procedure involving punching with a large number of holes to facilitate penetration by brine. It was experimentally ascertained that fungal infection could only occur in cheese with moisture and salt contents of 25 and below

6 per cent., respectively. It would appear inadvisable to puncture the cheese in the manner indicated, since all the samples so treated were contaminated, showing that the spores enter through the punctures.

HAWKER (LILIAN E.). **Further experiments on the Fusarium bulb rot of Narcissus.**—*Ann. appl. Biol.*, xxii, 4, pp. 684–708, 2 diags., 1935.

This is a progress report of the results of experiments carried out at Slough in continuation of Gregory's investigations of the bulb rot of narcissus caused by *Fusarium bulbigenum* [*R.A.M.*, xii, p. 224; xiii, p. 366]. It was shown that under suitable moisture conditions and at fairly high temperatures (27° to 30° C.) the fungus is capable both in the storerooms and in the soil of entering and destroying the roots of all the *Narcissus* varieties tested, and also of entering the bulbs of susceptible varieties through the parasitized roots. Evidence at hand, however, indicates that in England temperatures are seldom favourable during the autumn for the penetration of the fungus into the bulbs through the young roots, but that such penetration may occur through the old roots at the end of the growing season, when soil temperature is likely to be more favourable for attack.

While a confirmation was found of Gregory's statement that the standard hot water treatment of the bulbs against eelworm (*Anguillulina dipsaci*), when carried out in the autumn, may lead to heavy losses caused by *F. bulbigenum* [loc. cit.], experimental treatment of narcissus bulbs, during the storage period, with hot water, to which spores of the fungus had been added, indicated that the bulbs pass through a phase of minimum susceptibility in late August and early September, i.e., at the time when the treatment is normally applied. A material reduction of the losses ensuing from hot water treatment in the presence of *F. bulbigenum* spores resulted from the addition to the water of 0·1 per cent. formalin. While no conclusive evidence has yet been obtained from extensive experiments with fourteen *Narcissus* varieties as to the effect of this addition of formalin to the hot water bath on the spread of the disease, it was amply shown that the incorporation of 0·5 to 1·5 per cent. formalin did not affect adversely the foliage, date of flowering, quality and number of flowers of the ensuing crop, or the increase in weight of the treated bulbs during the growing season, the effect often being beneficial. Steeping the bulbs in a cold 0·1 per cent. mercuric chloride solution for five hours led to a retardation by a few days of the date of flowering.

STRAUCHMANN (H.). **Ein Knollen-Konservierungsmittel.** [A corm preservative.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 45, p. 551, 1935.

Karsan, an effective preventive of storage rots of the potato [*R.A.M.*, xii, p. 718], is stated to have been applied to dahlia, begonia, and gladiolus corms at Erfurt with similarly beneficial results. The powder is hygroscopic and the opened tin should be placed in a warm atmosphere for some hours before use. Regular treatments at three- to four-weekly intervals are advisable.

WICKENS (G. M.). **Wilt, stem rot, and dieback of the perpetual flowering Carnation.**—*Ann. appl. Biol.*, xxii, 4, pp. 630–683, 2 pl., 3 figs., 3 diags., 1935.

In this paper the author gives a detailed account of his investigations from 1930 to 1934 of the stem rot and die-back diseases of glasshouse carnations in England, a preliminary report of which has already been noticed [*R.A.M.*, xiii, p. 515; cf. also ibid., xiv, p. 636]. Isolations from stem-rotted plants yielded at first various non-pathogenic species of *Fusarium*, but when made from the xylem and pith *Verticillium cinerescens* [loc. cit.] predominated, and during 1933, out of 120 plants examined 107 gave this fungus alone, 5 in combination with *F. culmorum*, 1 with *F. herbarum* [*F. avenaceum*], and 6 with *Fusarium* spp. *F. avenaceum* was also isolated once alone. During 1934 similar results were obtained from material from 16 nurseries, but in one nursery 19 plants only yielded a species provisionally identified by Wollenweber as *F. dianthi* [cf. ibid., xiv, p. 636], to the exclusion of the *Verticillium*. *F. dianthi* was also isolated occasionally from plants of other nurseries.

From the results of inoculation experiments [which are described in detail], the author concludes that the disease known to growers in England as 'stem rot' is a complex of three different diseases, namely, (*a*) stem rot caused by *F. culmorum*, *F. avenaceum*, and probably several other species of this genus, involving indiscriminate rotting of the cortex at the collar, with no extensive vascular discoloration, and occasionally killing the plant; these fungi were shown to have little power of attacking established carnation plants, even when artificially inoculated through wounds; (*b*) a wilt disease due to *F. dianthi*, involving vascular discoloration followed by a dry, 'shreddy' rot, and (*c*) the wilt caused by *V. cinerescens*, resulting in a brown discoloration of the vascular system of the collar and wilting of shoots without any later rotting of stem tissues. The last-named fungus is widely distributed and is mainly responsible for the heavy losses to carnation growers in England. It was shown to be capable in contaminated soil of infecting carnation plants through wounds at various stages of their development, from cuttings upwards. Under strictly experimental conditions it caused a typical wilt, developing chiefly in the water-conducting elements and producing no obvious rotting of the stem. The accompanying leaf chlorosis was rather less marked than in the *F. dianthi* wilt.

The disease commonly known as 'die-back' appears to be caused mainly by *F. culmorum*. In one experiment, however, inoculation with *V. cinerescens* also resulted in the development of a condition of the 'die-back' type, but it is not yet known to what extent this may occur in nature.

A brief description is given of the morphological and biological characters of the causal organisms. The optimum temperature for growth in culture was shown to be about 25° C. for *F. culmorum* and *F. avenaceum*, 29° for *F. dianthi*, and 20° for *V. cinerescens*. The last-named fungus failed to grow at 35° but not at temperatures as low as 1° to 5°, while *F. dianthi* grew strongly at 35° and not at all at 10°.

Histological examination of carnation plants in the very early stages of infection showed the presence of *V. cinerescens* in parts of shoots well beyond the limits of any macroscopically visible internal or external lesions, while *F. dianthi* has not as yet been isolated from regions outside the limits of visible vascular discoloration. It was experimentally shown that heavy infection of carnation plants with *V. cinerescens* occurred at all the soil moistures tested.

In a discussion of possible means of control it is stated that infection of fresh crops may result from the presence of *V. cinerescens* in the top soil and subsoil of old beds, or may be introduced into new beds with apparently healthy cuttings taken from infected stock, thus rendering top and subsoil disinfection of carnation beds ineffective. The adoption of raised beds with the subsoil separated by a layer of cement and sterilization by heat or chemicals are stated to have met with considerable success, while the use of cuttings from healthy stock grown in a special house has also resulted in a striking reduction in the percentage of infected plants. It is recommended that a search for resistant strains should be made among the numerous seedlings which are raised by specialists for the production of new varieties of the carnation.

Brown (W.). **Stem-rot disease of the perpetual-flowering Carnation.**—*Gdnrs' Chron.*, xcviii, 2546, pp. 267–268, 1935.

Following a comprehensive summary of G. W. Wickens's work on the stem rot of glasshouse carnations (chiefly *Verticillium cinerescens*) in England [see preceding abstract], the author states that heat sterilization of infected soil is effective in controlling the fungus provided the heat penetrates far enough into the subsoil, this being the practical difficulty of the method. The use of cement-floored beds and steam-sterilized soil has given highly satisfactory results, and chemical disinfection of the beds by formalin (5 galls. of 1 in 50 solution per sq. yd.) appears to be promising. The rearing of stock plants in a special house and taking cuttings only from one-year-old plants are being successfully adopted.

Scholz (W.). **Über die Chlorose der Hortensie (Hydrangea hortensis) in ihrer Beziehung zum Eisen.** [On *Hortensia* (*Hydrangea hortensis*) chlorosis in its relation to iron.]—*Z. PflErnähr. Düng.*, A, xli, 3–4, pp. 129–164, 1935.

A comprehensive, fully tabulated account is given of the writer's experiments at the Friedrich Wilhelm University, Breslau, Silesia, on iron availability in relation to chlorosis, a very serious disease of *Hydrangea hortensis*, which may develop the symptoms at any stage of its growth. The disturbance is thought to originate in an excess of lime, which impedes the solubility of the iron in the soil and prevents its ready assimilation by the plant. Analyses of the affected leaves have shown them to be neither excessively rich in lime nor notably deficient in iron but the uniform distribution of the mineral through the foliage is hindered, with the result that it accumulates in the basal leaves, while the young growth shows a chlorotic discoloration. The addition of iron to the fertilizer relieved the chlorotic symptoms but

failed to increase the dry weight production, which remained abnormally low.

SCHOLZ (W.). **Über die Chlorose der Becherprimel (Primula obconica Hance) in ihrer Beziehung zum Eisen.** [On chlorosis of the goblet Primula (*Primula obconica* Hance) in its relation to iron.]—*Z. PflErnähr. Düng.*, A, xli, 5–6, pp. 275–282, 1935.

Like the hydrangea [see preceding abstract], *Primula obconica* is highly susceptible to lime-induced chlorosis associated with iron deficiency or unavailability [*R.A.M.*, v, p. 669], and the writer's experiments indicated that both plants respond similarly to the inclusion of iron in the fertilizer.

NEIS (W.). **Beobachtungen über den Löwenmaul-Rost.** [Observations on Snapdragon rust.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 46, p. 562, 1935.

Since 1934 *Puccinia antirrhini* is stated to have caused heavy damage to the snapdragon [*Antirrhinum majus*] plantings in the Treves district of Germany [*R.A.M.*, xiv, p. 447], the lower side of the leaves being so densely covered with pustules that the spores are broadcast in cutting the flowers or passing along the rows. The disease does not appear until towards the end of July [cf. next abstract], so that the first crop may be gathered without fear of infection. Attempts to combat the rust by the repeated application of Bordeaux mixture proved fruitless.

LAUBERT (R.). **Weitere Betrachtungen über den Löwenmaulrost.** [Further observations on the Snapdragon rust.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 47, p. 574, 1935.

In the Mülheim (Ruhr) district of Germany the spread of snapdragon (*Antirrhinum majus*) rust (*Puccinia antirrhini*) appeared to be less rapid in 1935 than in 1934, the first attacks being detected at the beginning of September [cf. preceding abstract]. The disease is by no means confined to the newly introduced American types and in many cases the yellow-flowering varieties appeared to be singled out for attack. Inoculation experiments with the rust gave positive results after an incubation period of a fortnight on healthy *A. majus* plants, but the wild *A. orontium* [*R.A.M.*, xiv, p. 364] proved highly resistant, eventually succumbing only after 25 days when the healthy infected plants were kept for some days under a bell-jar; this species, therefore, is unlikely to constitute a serious source of contamination.

MAINS (E. B.). **Rust resistance in Antirrhinum.**—*Phytopathology*, xxv, 11, pp. 977–991, 2 figs., 1935.

Continuing his studies on the possibilities of breeding snapdragons (*Antirrhinum majus*) for resistance to rust (*Puccinia antirrhini*) [see preceding abstracts] in the United States [*R.A.M.*, iii, p. 721], the writer found that most of the commonly cultivated species and varieties are very susceptible to the disease. A few selections were obtained, however, showing some degree of resistance, and by means of self-pollination and selection some highly resistant types have been evolved.

In 1927, for instance, resistant plants of *A. glutinosum* were crossed with the resistant strain, GWD1, of Giant White. The F_1 plants were all extremely resistant; in the F_2 segregation into 45 highly resistant, 40 moderately resistant, and 11 very susceptible took place. In 1932 two cases (9–1–3 and M12) of clear-cut separation into an extremely resistant and a very susceptible group were obtained, and in the next year five lines proved to be homozygous for marked resistance. The flowers of these hybrids are white, but somewhat smaller and narrower than those of the Giant parent. In 1932 several crosses were made between the most outstanding resistant segregates of 9–1–3 lines and susceptible commercial types, two of which yielded in the F_1 highly resistant and very susceptible segregates in the ratios of 10:11 and 12:14, while one produced only highly resistant individuals. The F_2 from three resistant F_1 plants consisted of 290 resistant and 101 susceptible, closely approximating to a ratio of 3:1, from which it appears that the marked resistance of the 9–1–3 lines is due to a simple dominant factor [ibid., xiv, p. 172]. Crosses between the highly resistant *A. ibanjezii* Cartagena and a susceptible pink commercial snapdragon yielded 21 uniformly resistant plants, while the F_2 segregated into 113 extremely resistant and 32 very susceptible, again denoting a simple dominant factor for resistance. Species of the related genera *Linaria* and *Adenostegia* [*Cordylanthus*] included in the tests were not attacked by *P. antirrhini*.

PRETI (G.). **Una malattia dell' 'Antirrhinum majus' L. nuova per la micologia italiana ('Puccinia antirrhini' Dietel e Holway).** [A disease of *Antirrhinum majus* L. new to Italian mycology (*Puccinia antirrhini* Dietel & Holway).]—*Riv. Pat. veg.*, xxv, 9–10, pp. 361–372, 5 figs., 1935.

In the spring of 1935 snapdragon (*Antirrhinum majus*) rust [*Puccinia antirrhini*: see preceding abstracts] not previously recorded in Italian literature killed off a number of plants growing in a private garden in Florence, where the disease had been observed but not identified in the preceding November. The disease, which was probably introduced on seed imported from London, was confined to a few gardens in proximity to that in which the original infection occurred. Volunteer plants in the vicinity later became affected. The control measures recommended consist in the destruction of the affected plants, spraying with a copper mixture of not over 1 per cent. concentration or dusting with sulphur, and the selection of resistant varieties.

WIERINGA (K. T.). **Een bacterieziekte voorkomende bij Begonia's.** [A bacterial disease occurring among Begonias.]—*Tijdschr. PlZiekt.*, xli, 11, pp. 309–313, 1 pl., 1935.

An account is given of a bacterial disease affecting begonias in Holland, the large-flowered varieties being particularly susceptible while Gloire de Lorraine is more rarely attacked. Small, water-soaked lesions originate near the leaf edges and gradually spread over the whole surface, ultimately involving the petioles and stems, which soften and turn black, whereupon the stem collapses. The diseased

leaves become brown and shrivelled. The yellow slime exuded from the petioles and stems is composed of non-motile bacteria, 3 to 5 by 0·5 μ, forming on meat bouillon- or yeast extract-agar sulphur-yellow colonies with entire margins, liquefying gelatine, producing acid from glucose, saccharose, and lactose, splitting starch and casein, not fermenting or reducing nitrates. Yeast extract-agar was found to be a particularly favourable medium, but good growth also occurred in a synthetic inorganic solution with 1 per cent. glucose. The organism is evidently not exacting in its food requirements and is probably capable of developing in the soil. The optimum temperature for growth is 28° C. The bacterium differs from the agent of a similar disease of begonias in Denmark [*Bacterium begoniae*: *R.A.M.*, xiii, p. 308] in its non-motility, and is regarded as a new species to which the name *Phytomonas flava begoniae* is given.

At Aalsmeer a peculiar gloss on the leaves was considered by a local grower to be a sure sign of the bacterial disease, of which a leaden tint on the foliage is also frequently characteristic. In both these cases the typical leaf spots may be absent and infection presumably occurs through the vascular bundles of the stem. The bacteria are probably spread to some extent by the implements used in cultural operations as well as by the planting of cuttings in infested soil. Pending further studies on the conditions promoting infection by *P. flava begoniae* the best hope of control lies in the selection of healthy mother plants and scrupulous care in the handling of the cuttings.

WHITE (R. P.) & HAMILTON (C. C.). **Diseases and insect pests of Rhododendron and Azalea.**—*Circ. N.J. agric. Exp. Sta.* 350, 23 pp., 2 pl., 1935.

Popular notes are given on the symptoms, etiology, and control by an appropriate spray schedule of a number of rhododendron and azalea diseases, including (apart from those noticed from another source) [*R.A.M.*, xii, p. 696] chlorosis (curable by the application of 0·25 per cent. ferrous sulphate), *Exobasidium burtii* and *E. vaccinii-uliginosi* [ibid., xiv, pp. 65, 174], and *Phytophthora cryptogea* (on *R. maximum*, *R. catawbiense*, and *R. carolineanum*).

DODGE (B. O.). **A bacterial disease of Delphinium ajacis.**—*J. N.Y. bot. Gdn*, xxxvi, 431, pp. 257–260, 2 figs., 1935.

In July, 1935, a bed of *Delphinium ajacis* at the New York Botanic Garden was observed to be affected by a destructive disease causing severe stunting and a soft, malodorous rotting of the tops, the root system apparently remaining healthy. When the stems of infected plants were split down to the base they showed an irregular, streaky, black discoloration of the pith, most of which was disintegrated, and mucilaginous masses of bacteria were exuded from the tissues, while masses of long, thin crystals accompanied the organism reminiscent of those associated with the agent of gladiolus scab (*Bacterium marginatum*) [*R.A.M.*, iv, p. 287 *et passim*]. Promising results in the control of the disease, further investigations on which are in progress, were given by spraying with Bordeaux mixture, also recommended for the control of 'blacks' [*Bact. delphinii*: ibid., iv, p. 480; xiii, p. 356], a

purely local black spotting of the leaves, occasionally involving the flowers and stems.

LINDEGG (GIOVANNA). **Cancro picciolare dell' Acanto 'Acanthus mollis' L.** [Petiole canker of *Acanthus, Acanthus mollis* L.]—*Riv. Pat. veg.*, xxv, 5–6, pp. 229–236, 2 figs., 1935.

When *Acanthus mollis* plants inadvertently kept during winter in rather cold, damp conditions under glass in Italy were removed from the pots the leaf stalks snapped off at the base leaving the plants almost denuded of their outer leaves. A depressed, blackish, canker-like lesion measuring up to 5 by 2½ cm. was present at the point of rupture, and sporodochia were observed in the thick weft of hyaline, septate, simple or branched hyphae covering the affected tissues. The simple, occasionally branched, or, more often, bifid, hyaline conidiophores measured 20 to 28 by 4 μ and were sharply pointed at the apex. The hyaline to faintly pink, cylindrical-fusoid, slightly curved conidia measured 8 to 12 by 3·7 to 4 μ, and were rounded at the ends. The fungus is named [with a Latin diagnosis] *Fusoma calidariorum* Sacc. var. *acanthi* n.var.

GANTE (T.). **Die Schorfkrankheit des Feuerdorns.** [The scab disease of *Pyracantha*.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 47, p. 573, 2 figs., 1935.

The popular shrub, *Pyracantha coccinea* [*Crataegus pyracantha*], is stated to suffer considerable damage in the Geisenheim (Rhine) district of Germany from scab (*Fusicladium pirinum* var. *pyracanthae*) [*R.A.M.*, viii, p. 268] the unsightly black spots of which spoil the decorative effect of the bright orange berries. The conidia of the fungus in the German material were found to measure 11 to 16 by 5 to 8 μ and are thus appreciably shorter than those of *F. pirinum* [*Venturia pirina*] (20 to 30 by 5 to 9 μ). The disease is largely preventable by giving the shrubs ample space and planting them in a sunny situation.

KLEBAHN (H.). **Einige Beobachtungen und Versuche über den Mahonia-Rost.** [Some observations and experiments on the *Mahonia* rust.] —*Z. PflKrank.*, xlv, 11, pp. 529–537, 3 figs., 1935.

In discussing the rapid spread of *Uropyxis mirabilissima* (*Cumminsiella sanguinea*) [*R.A.M.*, xiii, pp. 185, 447] in Europe, the author suspects that the disease, first observed by Zimmermann in 1927 [ibid., ix, p. 787] at Rostock, may have been introduced with the plants in 1910 or 1912, since a neighbouring garden was free from the disease; spread appears to be effected even more by nursery stock than by natural factors, for many plantings have been found free from infection in diseased areas. Observations and experiments [details of which are given] showed that aecidia of *Puccinia graminis* are formed on *Mahonia* fruits but not those of *C. sanguinea* which occurs only on the leaves. An exsiccatum of aecidia on *Mahonia* leaves contained in Sydow's Uredinales (No. 1819) showed, on careful examination of the material, the presence of spores of *P. graminis*, with the characteristic thickening of the wall, and those of a fungus comparable with *C. sanguinea*, without this feature. The spores from the fruits (No. 2122) show a distinct thickening and are therefore referable to *P. graminis*.

The aecidia of the rust collected by the writer on *Mahonia* leaves measured 135 to 170 by 120 to 160 μ, compared with 140 to 150 by 150 μ in Sydow's material, the corresponding dimensions for those on *Berberis* leaves (Pfeiffer v. Wellheim's specimen) and *Mahonia* fruits being 260 to 300 by 170 to 250 μ and 225 to 235 by 250 to 260 μ, respectively.

It cannot be decided from these data whether exsiccatum 1819 is identical with *P. graminis* or *C. sanguinea,* though the balance of evidence is perhaps in favour of the latter, and the occurrence of *C. sanguinea* in Mark Brandenburg in 1903 still remains therefore a matter of uncertainty.

JENKINS (ANNA E.) & UKKELBERG (H. G.). **Scab of Goldenrod caused by Elsinoe.**—*J. agric. Res.*, li, 6, pp. 515–525, 7 pl., 1 map, 1935.

An account is given of a scab of golden rod (*Solidago* spp.), which was first noticed in 1933 in the Edison Botanic Garden at Fort Myers, Florida (where they are being studied because of their high content in rubber), attacking the young growth of the plants which, however, usually attain maturity more or less normally, although new growth becomes infected as it develops. Occasionally young plants may be killed or stunted. Some of the leaves wilt and die as they unfold, while others that expand later may also be killed; in severe cases the stem may be practically devoid of leaves for several centimetres, though it usually remains alive even though girdled by the causal fungus. On the highly susceptible *S. sempervirens* the leaf spots occur more frequently on the under side, and often involve the midribs, veins, petioles, and the basal part of the sessile leaves. The leaf lesions range from punctiform to circular, subcircular or irregular spots up to 5 mm. in diameter, and may be depressed on one side and bulging out on the other. At first they are brown to madder-brown and water-soaked, later vinaceous buff, and finally white or grey. On the stems they are of the same colour but may be surrounded by a narrow dark line. On *S. edisoniana* and related species the leaf spots are circular to subcircular, 2 or 3 mm. in diameter, and more or less permanently hazel- or brick-red.

The causal fungus is considered to be a new species of *Elsinoe,* and is named *E. solidaginis* [with Latin and English diagnoses]. The ascomata are apparently intra-epidermal up to 150 μ in surface diameter and 50 μ thick, with a dark-coloured epithecium up to 20 μ thick; the asci are mostly spherical to obpyriform, 15 to 17 by 15 to 18 μ, occasionally with a small stipe; the ascospores are hyaline, 2- to 3-celled, and 8 to 13 by 4 to 5 μ. The *Sphaceloma* stage, which was observed in nature, has ovoid to oblong-elliptical conidia, 6·5 to 8·6 by 2·5 to 4 μ, germinating by means of a germ-tube or by the production of sprout conidia. The pathogenicity of the fungus to *Solidago* spp. was proved by inoculation experiments. The species known to be susceptible are *S. chapmani, S. edisoniana, S. elliottii, S. fistulosa* [Mill. = *S. pilosa* Walt.], *S. leavenworthii, S. mirabilis,* and *S. sempervirens.*

Evidence was obtained that the disease has been present in Fort Myers since at least 1930, and that it also occurs in Florida and Georgia.

YARWOOD (C. E.). **Heterothallism of Sunflower powdery mildew.**—*Science*, N.S., lxxxii, 2131, pp. 417–418, 1935.

Perithecial formation only on certain areas of diseased leaves and at the intersection of two mildew colonies indicated the probability of heterothallism in *Erysiphe cichoracearum* on sunflower (*Helianthus annuus*) [*R.A.M.*, xiii, p. 804]. Fifteen monoconidial cultures were isolated and maintained on excised sunflower leaves in a sucrose solution [cf. ibid., xiv, p. 174]. One of these cultures has been grown for over four months and all for six weeks or more under varied conditions without any sign of perithecial production, whereas the combination of certain cultures led to the formation of those organs. In two out of three tests with two of the cultures, 1 and 1A2, simultaneous inoculations on excised leaves floating on sucrose solution, and in all three trials with cut leaves with their petioles in flasks of a mineral nutrient solution perithecia were formed. In one test, all twelve inoculations either with 1 or 1A2 alone resulted in conidial formation only, while 17 out of 20 with the two cultures together gave perithecia as well. These data are considered to afford reasonable proof of heterothallism in *E. cichoracearum*, this being apparently the first record of the phenomenon in question among the Erysiphaceae.

POWELL JONES (A.) & MOORE (H. I.). **The honey fungus.**—*Gdnrs' Chron.*, xcviii, 2547, pp. 284–285, 1 fig., 1935.

Attention is drawn to the risks involved in the failure to destroy fallen trees or other débris infected by *Armillaria mellea*, which rapidly spreads to a large number of other hosts, 39 being listed, including fruits, vegetables, and ornamental shrubs. The more conspicuous features of the fungus, its life-history and mode of infection, are also described in semi-popular terms with special reference to the possibilities of prevention and control.

NUSBAUM (C. J.). **A cytological study of the resistance of Apple varieties to Gymnosporangium juniperi-virginianae.**—*J. agric. Res.*, li, 7, pp. 573–596, 1 pl., 4 figs., 1935.

An expanded account is given of the author's cytological studies of the development of artificially produced infections with apple rust (*Gymnosporangium juniperi-virginianae*) [*R.A.M.*, xv, p. 160] on the leaves of Wealthy (susceptible), Yellow Transparent (moderately resistant), Fameuse (resistant), and Baldwin (very resistant), apple varieties, an abstract of which has already been noticed [ibid., xiv, p. 368]. In addition to the results already given, the author states that in the Wealthy apple the injury to the host cells following penetration of the usually simple haustoria was slight, generally only resulting in a reduction in the number of plastids. Up to the tenth day, the fungus spread vigorously in all directions, especially in the spongy parenchyma, but coincident with the formation of pycnidia, the marginal spread almost ceased. In the vicinity of the pycnidia, the spongy parenchyma cells became hypertrophied, resulting in the obliteration of the large intercellular spaces and in the collapse of a portion of the lower epidermis, as well as of the haustoria in the broken-down cells.

In the leaves of the resistant varieties tested, the fungus died before any injury to the host cells occurred, and its failure to establish itself is attributed to antagonism of the host protoplasts and not to hypersensitiveness. Infections also usually failed to develop when young Wealthy leaves were inoculated on the dorsal surface, but in this case the failure is attributed to starvation, since the secondary invading hyphae usually shrivelled and collapsed before they could establish contact with the mesophyll cells. Finally, the complete resistance to the rust observed in old Wealthy leaves is thought to be due to physical properties of the epidermis.

PESANTE (A.). **Existence de formes ou de races biologiques dans 'Stromatinia fructigena' et 'Stromatinia cinerea'.** [The existence of biologic forms or races in *Stromatinia fructigena* and *Stromatinia cinerea*.]—*Boll. Sez. ital. Soc. int. Microbiol.*, vii, 10, pp. 383–388, 1935.

In the autumn of 1934, the author isolated numerous strains of *Stromatinia* [*Sclerotinia*: *R.A.M.*, xiii, p. 34] from ripe apple, pear, peach, and quince fruits and in the spring from withered apricot branches and flowers; most of the strains obtained from the fruits belonged to *S. fructigena*, while those from apricot branches and flowers belonged, respectively, to two different strains of *S. cinerea* [*S. laxa*: ibid., xv, p. 159]. Of two other strains obtained from apple fruits one agreed perfectly with *S. laxa* in its conidial measurements and cultural characters, while the other appeared to be intermediate between *S. laxa* and *S. fructigena*.

The different strains of *S. fructigena* and *S. laxa* differed widely from one another in their cultural characters on various media. Many more strains of *S. fructigena* were isolated than of *S. laxa*, and on carrot agar a series of cultures of the former was obtained, varying from strains showing a stroma of average consistency with only traces of conidia, to strains in which the entire surface of the culture was covered with them. On Czapek's agar the strains of *S. fructigena* obtained ranged from those lacking any brown mycelium to others where such mycelium covered the whole surface of the colony. In some cases true sclerotia were produced.

Artificial inoculations of ripe apples with a strain of *S. laxa* from apple and with various strains of *S. fructigena* caused different amounts of flesh-blackening; the conidial pustules that formed also differed widely in number and appearance, some being compacted and others cottony. The strain of *S. laxa* used produced a very diffused discoloration with traces of aerial mycelium, but no conidia. That each species comprises a number of races was confirmed by the use of monoconidial cultures from some of the strains. Further experiments on various media afforded additional proof of the constant cultural behaviour and individuality of the various strains.

MITRA (A.). **Investigations on the wound parasitism of certain Fusaria.**—*Indian J. agric. Sci.*, v, 5, pp. 632–637, 1 pl., 1935.

Artificial inoculations by the cork-borer method [*R.A.M.*, ix, p. 391] or an adaptation of it on 'hill' and Kashmir apples and potato tubers

with *Fusarium camptoceras* [ibid., xiv, p. 472], *F. solani* var. *medium*, *F. diversisporum*, *F. semitectum*, *F. semitectum* var. *majus*, and *F. moniliforme* [*Gibberella moniliformis*] showed that on apples the last-named caused much rotting of both varieties (average percentage of rot, 22·01), while *F. solani* var. *medium* produced an average of only 1·44 per cent. damage, and *F. camptoceras*, *F. semitectum*, and *F. semitectum* var. *majus* were harmless. That the rots were due to the fungi used was verified by re-isolating them from the infected fruit. Potatoes were attacked only by *F. solani* var. *medium*, which caused a dry rot. Saltants exhibited the same parasitic activities on potatoes as their respective parents.

ARNAUD (G.) & BARTHELET (J.). **Essais de traitements des arbres fruitiers et de la Vigne en 1935.** [Experiments with treatments of fruit trees and Vines in 1935.]—*C.R. Acad. Agric. Fr.*, xxi, 29, pp. 1094–1100, 1935.

In experiments on the control of pear scab (*Venturia pirina*) at the Versailles Phytopathological Station [*R.A.M.*, xiv, p. 454], of three applications of Bordeaux mixture made on 10th April, 6th May, and 21st June, the third was the most efficacious and there was comparatively little difference between the trees receiving this treatment alone and those given all three. This is a very unusual observation, the first treatment being normally the most effective. Theoretically, it is inadvisable to spray an orchard in blossom, but in practice the writers have observed little or no injury among trees so treated. Attention is drawn to the occurrence of scab lesions, up to 5 or 6 cm. in length, situated some 20 cm. from the base of the shoot, on the branches of the Doyenné du Comice variety, the fruit of which is resistant. Late scab was of very little importance at Versailles in 1934.

Neither copper oxychloride nor copper sulphate plus 1 gm. vanadic acid per hectol., as recommended by Branas and Dulac to eliminate the tendency to burning and increase adhesion, proved equal to ordinary Bordeaux mixture in the control of vine downy mildew (*Plasmopara viticola*), though both gave fairly good results.

CATION (D.). **One spray controls Peach leaf-curl.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xviii, 2, pp. 86–88, 1935.

A popular note is given on the symptoms of peach leaf curl (*Taphrina deformans*) and its control under the meteorological conditions prevailing in Michigan, where attacks may be expected in at least three out of five years. Complete prevention of infection is stated to be practicable by the application of either a dormant spray (1st March to 1st April) of 5 in 100 lime-sulphur or an autumn treatment with 8–8–100 Bordeaux mixture.

CAPUCCI (C.). **Osservazioni sulla resistenza di alcune varietà di Pesco all' Exoascus deformans.** [Observations on the resistance of some Peach varieties to *Exoascus deformans*.]—*Romagna agric. zootec.*, 6–7, pp. 155–162, 1935. [Abs. in *Riv. Pat. veg.*, xxv, 9–10, pp. 398–399, 1935.]

During a very severe outbreak of leaf curl (*Exoascus* [*Taphrina*]

deformans) [*R.A.M.*, xiv, p. 594] in Italy in 1934, which had been favoured by neglected or careless spraying, the following peach varieties remained entirely unaffected: Fior di maggio, Bonfiglioli rossa, Bella di Roma tardiva, S. Anna piccola, Buco incavato, Tardivo di Massa Lombarda, and Krummel October. The Amsdem variety was very resistant.

KADOW (K. J.) & ANDERSON (H. W.). **The role of zinc sulphate in Peach sprays.**—*Bull. Ill. agric. Exp. Sta.* 414, pp. 207–255, 8 figs., 1 graph, 1935.

Peach trees in Illinois sprayed five times at fortnightly intervals during summer with lead-lime (3–6–100), lead-lime-zinc (3–8–8–100), the same (3–8–4–100) with the fifth application omitted, and lime-zinc (8–8–100) showed, respectively, 1·2, 2·6, 1·8, and 2·05 per cent. scab (*Cladosporium carpophilum*) [*R.A.M.*, xiv, p. 683], as compared with 23·1 per cent. in the untreated control plot. This result indicates that as a fungicide zinc sulphate possesses no particular advantage over lead arsenate-lime, though either lead-lime or lead-lime-zinc is adequate for commercial control of the disease under average conditions.

In laboratory tests zinc sulphate was slightly toxic to the germination of the spores of *Sclerotinia fructicola*. For both diseases sulphur appears to be a much more effective fungicide than zinc sulphate-lime.

The amounts of bacterial spot (*Phytomonas* [*Bacterium*] *pruni*) [ibid., xiv, pp. 641, 682] that developed on the trees given the first, second, and fourth treatments mentioned above were, respectively, 6·25, 5·4, and 5·95 per cent., as compared with 5·9 per cent. in the control plot. The evidence obtained showed that zinc sulphate in spray mixtures prevents the cracking and corky tissue formation that generally results when fruit affected by *Bact. pruni* is treated with lead arsenate-lime sprays. Lime alone was more toxic to the growth of *Bact. pruni* in culture than zinc sulphate, lead arsenate, or any combination of all three. These results, together with general field observations, are considered to show that zinc sulphate, however used, is a very poor bactericide, and that zinc sulphate-lime sprays, applied specifically against *Bact. pruni*, are probably valueless.

Details are also given of the authors' investigations into the effect of zinc on peach growth and the use of zinc sulphate as a corrective for lead arsenate spray injury. Applied as a nutrient solution to peach seedlings growing in purified quartz sand, zinc sulphate measurably increased growth, though on seedlings in Carrington silt loam soil it had practically no effect.

DU PLESSIS (S. J.). **Groen-verrotting van Appelkose en terugsterf van Appelkoosboomtakkies veroorsaak deur Sclerotinia sclerotiorum (Lib.) Mass.** [Green rot of Apricots and die-back of Apricot branches caused by *Sclerotinia sclerotiorum* (Lib.) Mass.]—*S. Afr. J. Sci.*, xxxii, pp. 238–245, 4 figs., 1935.

Green rot of apricots (*Sclerotinia sclerotiorum*) [*R.A.M.*, xiv, p. 315] was first observed in South Africa in 1924, and in 1932 the writer found it to be very prevalent in the Wellington district of Cape Province, where the fruit is extensively grown. The fungus also causes a die-back

of the young branches, in which it is capable of persisting until the following season, so that the removal of infected material during pruning operations is an important measure of control. Infection of the branches can take place only through wounds or through the pedicel of a rotted fruit. Sclerotia have not been detected on diseased wood in the open but may develop on material transferred during the current season to a moist atmosphere. The actual site of infection is limited to a small area, the rest of the branch dying off in consequence of the emission of toxic substances by the fungus.

TRANZSCHEL (V.). **La ruggine del Ciliegio: 'Leucotelium cerasi' (Béreng.) n. gen. n. comb. ('Puccinia cerasi' Cast.) ed il suo stadio ecidiale.** [The Cherry rust: *Leucotelium cerasi* (Béreng.) n. gen. n. comb. (*Puccinia cerasi* Cast.) and its aecidial stage.]—*Riv. Pat. veg.*, xxv, 5–6, pp. 177–183, 1935.

After pointing out that *Puccinia cerasi*, recorded in Italy on cherry, *Prunus avium*, peach, myrobolan (*P. cerasifera*), and *P. spinosa*, has hitherto been known only in its uredospore and teleutospore stages (the latter appearing in autumn and germinating shortly after), and that as all these hosts shed their leaves in autumn the basidiospores must infect some other plant on which the aecidia develop in spring, the author states that aecidia morphologically resembling those of *Tranzschelia* [*Puccinia*] *pruni-spinosae* [*R.A.M.*, xiv, p. 676] have been found on *Eranthis hiemalis* in the same localities as *P. cerasi*. Inoculation experiments [which are described] with aecidiospores from *Eranthis* on cherry and *Prunus padus* gave positive results and in other tests, *Puccinia cerasi* from cherry infected *Prunus avium*, *P. fructicosa*, *P. nana*, cherry, plum, apricot, *P. padus*, *P. virginiana*, and *P. maackii*.

The spermagonia found on *E. hiemalis* being subcuticular cannot belong to a *Puccinia*, in which these organs are immersed in the mesophyll; on the other hand, the teleutospores of *P. cerasi* differ from those of *Tranzschelia* in their colourless epispore and autumnal germination. The author therefore considers that *P. cerasi* does not belong to *Tranzschelia*, and transfers it to a new genus [provided with a Latin diagnosis] *Leucotelium* as *L. cerasi*, the closely related *P. padi* and *P. pruni-persicae* [ibid., xii, p. 248] being added as *L. padi* and *L. pruni-persicae*. The new genus lies between *Tranzschelia* and *Ochrospora*, the aecidia resembling those of the former, while the above-mentioned teleutospore characters bring it near to the latter. [A Russian version of this paper occurs in *Советская Бот.* [*Sovetsk. Bot.*], *1935*, 4, pp. 80–84, 2 figs., 1935.]

GOETZ (G.). **Einiges über die Johannisbeer-Welkekrankheit.** [Notes on the Currant wilt disease.]—*Obst- u. Gemüseb.*, lxxxi, 11, p. 172, 1 fig., 1935.

Popular notes are given on the symptoms, etiology, and control of currant wilt (*Verticillium albo-atrum*), which is stated to have been steadily increasing during the last twenty years in Germany [*R.A.M.*, xii, p. 117]. Red and white varieties are chiefly affected, the black ones being generally resistant. Diseased bushes—recognizable by their yellow foliage and shrivelled branches—should be removed and burnt

immediately on detection. *V. albo-atrum*, in addition to attacking a number of cultivated plants, also occurs on various weeds, e.g., deadly nightshade [*Solanum nigrum*], goosefoot [*Chenopodium*], and stinging-nettle [*Urtica*], the eradication of which in currant plantings is therefore important.

PADY (S. M.). **The role of intracellular mycelium in systemic infections of Rubus with the orange-rust.**—*Mycologia*, xxvii, 6, pp. 618–637, 42 figs., 1935.

Continued studies of the *Rubus* orange rust (*Gymnoconia interstitialis*) [*R.A.M.*, xiv, p. 642] showed that the aecidiospores of the two short-cycle strains of the rust germinate readily after being dusted on the very young leaves and shoots (about ½ in. in length) of blackberries and *R. occidentalis*, and produced fully formed promycelia of two and four cells, respectively, within 24 hours. Germination of the basidiospores follows immediately after their detachment from the basidia; the host epidermis is penetrated by a short germ-tube, which forms a typical penetration hypha; the latter produces intracellular branches which enter adjacent cells through the side wall, after which the entering hypha cuts off a terminal cell, and the subterminal cell gives rise to a branch which the author terms the primary runner. The terminal cell then divides, and a secondary runner is formed from the new subterminal cell; this cell is considerably enlarged with a characteristic rounded base, while the terminal cell continues to grow, becoming more or less compactly coiled and multicellular. The runners enter neighbouring host cells, where the same process is repeated, the result being a highly characteristic intracellular mycelium which, so far as the author is aware, has not yet been reported in other rusts. The mycelium continues to grow in this way through the cortex into the vascular bundles and the pith. From the tenth day from inoculation onward and continuing throughout the season, strands of intercellular mycelium begin to be formed in the phloem, arising from one of the runners, usually the primary one, which grows into the middle lamella and the intercellular spaces. The intercellular mycelium develops rapidly in the phloem, and becomes perennial in the host canes and roots. The intracellular mycelium, on the other hand, grows but little, if at all, during the next spring, and there is evidence that it degenerates later. Its function is apparently that of establishing the fungus in the host, and is probably haustorial in nature.

NOLAN (R. E.). **A root rot of Strawberry caused by a species of Diplodia.**—Abs. in *Phytopathology*, xxv, 10, p. 974, 1935.

A *Diplodia* of the *natalensis* group has been isolated from strawberries affected by a destructive root rot [in Florida]. Infection commences as a small, dark brown spot on the roots and progresses rapidly; infected roots may break off near the point of attack, but the symptoms proceed up to the plant. Inoculated plants are killed in six to ten days during hot weather. The disease was shown by soil temperature experiments to reach a climax at temperatures above 80° F. The *Diplodia* under observation is more active than *D. frumenti* in attacking

maize [*R.A.M.*, xiv, p. 564], while of the species used for comparison, *D. natalensis* was the most pathogenic to strawberries.

WILCOX (R. B.) & BECKWITH (C. S.). **The false-blossom disease of Cranberries.**—*Circ. N.J. agric. Exp. Sta.* 348, 4 pp., 1935.

Popular notes are given on the symptoms, mode of transmission, and control of false-blossom disease of cranberries in New Jersey [*R.A.M.*, xiv, p. 776]. In order to prevent the introduction and spread of the disorder, it is imperative to select healthy stock and to keep the plantings free from infection by systematic roguing. The insect carrier of false blossom, the blunt-nosed leaf-hopper [*Euscelis striatulus*], may be exterminated by the application of appropriate entomological measures [which are described in detail]. The practice of flooding, sometimes adopted for this purpose, should not be too often repeated where fungal rots are liable to become severe.

MAGEE (C. J.) & EASTWOOD (H. W.). **Corm rot of Bananas.**—*Agric. Gaz. N.S.W.*, xlvi, 11, pp. 631–632, 2 figs., 1935.

Banana corm rot, which has been present in New South Wales for some years, has recently become of greater importance in this locality as a result of the extension of banana planting to hardwood forest areas.

The condition, primarily a disease of new plantations on recently cleared land, is apparently caused by a species of *Clitocybe* [*R.A.M.*, xi, p. 382] and a number of undetermined Basidiomycetes [ibid., xii, p. 552; xiii, p. 251] which, after the trees have been felled, pass from the stumps and roots to the young banana plants, penetrate the roots and corms at or below ground-level, and spread towards the centre of the corm. The aerial parts of the banana plants show no marked symptoms until the fungi have obtained a good hold on the corm and roots, when the leaves turn yellow and collapse at their junction with the pseudostem. In advanced stages the plant is easily pushed over; it generally breaks off cleanly at or just above ground-level, showing a dry, brown corm with white fungous threads interwoven throughout.

Control consists in digging out and burning the infected stools and opening up the holes. Replacing individual plants is not recommended but, if done, planting should be effected some feet away from the infected site. When found, the original infection centres should also be destroyed. In a new plantation all roots should be removed from the vicinity of the set by digging large holes. Severely affected areas should not be treated piecemeal but replanted as a whole.

HORNE (W. T.) & PALMER (D. F.). **The control of Dothiorella rot on Avocado fruits.**—*Bull. Calif. agric. Exp. Sta.* 594, 16 pp., 3 figs., 1935.

The rot of avocado fruits caused by *Dothiorella gregaria*, the imperfect stage of *Botryosphaeria ribis* [var.] *chromogena* [cf. *R.A.M.*, vii, p. 621; xii, p. 79; xiv, pp. 196, 707] occurs in California probably wherever this host is cultivated, but causes serious losses only on fruit grown in certain coastal areas. Infection does not usually occur until after picking, when the softening process has begun. In typical cases

seen on Fuerte fruits at the stage known as 'breaking' (i.e., when the softening first becomes detectable) small dark spots with vague boundaries appear, new dark areas developing as the softening progresses. Spots under $\frac{1}{8}$ in. in diameter are light umber, vaguely bounded, and not sunken or distinctly marked. They often spread out as a pale margin from a speckle or blemish. As they become more distinct they darken slightly, but in the early stages are not black. They may reach $\frac{1}{2}$ in. in diameter in three or four days, when they are circular, not sunken, and rather uniformly pale. After this they spread more rapidly and become soft, sunken, and uneven, a watery rot advancing slowly into the flesh. A rank odour develops, and sometimes the rotting fruits fade to a greenish-grey. The surface settles and becomes uneven, after which the whole fruit shrivels up and becomes dark. The surface shows numerous small protrusions at the tips of which minute spore masses may appear as drops or coils, emerging from pycnidia; similar structures are found in the dead areas of tip-burned leaves and the bark of dead twigs.

Infection of the fruit is effected through the stomata, and the fungus makes considerable growth in the air-space below but is unable to penetrate farther until the fruit begins to soften. The difficulty of preventing the rot by treating the surface of harvested fruit is due to the protection afforded to the fungus by these air-spaces.

In the coastal areas of California the Fuertes avocado blossoms and sets fruit chiefly from March to May, but many 'off blooms' are set at other times. These do not mature with the principal crop, and have in the past been allowed to become senile, with the result that they failed to soften normally when picked. In such fruits the rot often developed early, the whole surface rotting before the inner flesh was completely soft.

Various treatments designed to destroy the spores on the fruit surface were unavailing. Four years' orchard-spraying tests were then carried out under commercial conditions, the fruit being handled in the same way as other consignments except that it was allowed to soften in the packing-house instead of being distributed to the markets. The data obtained showed that applications of Bordeaux mixture with flotation or wettable sulphur added gave complete control in 1932 and 1933, with only 0·5 per cent. infection against 54 per cent. in the controls in 1934, wettable sulphur giving the next best control (in the 1934 trials) with 4 per cent. infection. The authors recommend that where no cyanide fumigation is to be carried out the fruit should be sprayed when about $1\frac{1}{2}$ in. in diameter and again about two months later with a mixture of 16 lb. Bordeaux powder (or Bordeaux mixture 4–4–50), 6 lb. wettable sulphur, and 6 oz. blood albumin spreader in 100 galls. water. Where fumigation is necessary, it should be effected as soon as the fruit reaches $1\frac{1}{2}$ in. in diameter, and be followed at once by spraying with 6 lb. wettable sulphur and 6 oz. blood albumin in 100 galls. water, at least one further similar application being made six to eight weeks later. As a combined treatment for this disease and mottle leaf [ibid., xv, p. 146] the formula recommended is 16 lb. zinc sulphate crystals, 1 lb. copper sulphate, 8 lb. hydrated lime, 6 lb. flotation sulphur, and 6 oz. blood albumin in 100 galls. water; the

first spray should be applied when the fruit is about 1½ in. in diameter, and the second about two months later, fumigation, if practised, preceding the first spraying.

AZEVEDO (N.). **A 'variola' do Mamoéiro.** [Papaw pox.]—*Rodriguésia*, i, 2, pp. 91–93, 3 pl., 1935.

In Brazil all varieties of papaw are susceptible to a leaf-spot attributed to *Asperisporium caricae* [*R.A.M.*, xiv, p. 46], the imperfect stage of *Mycosphaerella caricae* [cf. ibid., xi, p. 662], small, whitish, later yellowish, finally red, slightly depressed spots appearing on the lower, and occasionally on the upper, surface of the leaves. The lowest leaves are attacked first, and infect the shoots as they develop; sometimes the fruits are affected, in which case infection may be severe enough to reduce their market value; the perfect stage was found in the epicarp of the fruit in the Zoological Garden in 1933. The disease spreads rapidly during rain- and wind-storms. Affected plants should be sprayed directly the spots appear with 1 per cent. Bordeaux mixture, a further application being made a fortnight later.

RECKENDORFER (P.). **Die chemischen Grundlagen der fungiziden Wirkung des Weinbergschwefels.** [The chemical foundations of the fungicidal action of vineyard sulphur.]—*Z. PflKrankh.*, xlv, 11, pp. 537–550, 1935.

The author reviews a number of different theories that have been advanced to explain the fungicidal action of sulphur on true mildew of the vine [*Uncinula necator*] and the powdery mildews [Erysiphaceae] of other plants, all the theories hitherto propounded being based on the presumed chemico-physiological nature of the fungicidal activity of sulphur.

In 1932 Feigl and Fränkel (*Ber.* [*? dtsch. chem. Ges.*], lxv, p. 545) published an account of a method for the detection of sulphur-containing acids and their salts by the induced oxidation of nickel dihydroxide. This process may be studied with the aid of a glass receptacle of 1 c.c. capacity fitted with a glass stopper on which is placed a small amount of freshly precipitated nickel dihydroxide. Within the receptacle is introduced the substance to be tested, and sulphur dioxide is liberated by acidification and slight warming, whereupon black nickel dioxyhydrate is formed. With small quantities of sulphur dioxide the change in colour of the green nickel dihydroxide is difficult to follow, but if benzidine acetate is added the benzidine blue formed by contact with the oxides permits the detection of extremely minute amounts of nickel trihydroxide and of sulphites or sulphur dioxide (*Chem. Ztg*, xliv, p. 689, 1920). Applying this method, the author carried out a series of experiments the results of which are set forth in detail and whence the following conclusions are drawn.

As a consequence of its rapid reactive capacity in the form of vapour, elemental sulphur is constantly liable to oxidation in the presence of atmospheric oxygen and thus capable of producing small quantities of sulphur dioxide which may be detected by the application of the prescribed microchemical colour tests. Discussing the marked superiority of 'ventilato' sulphur [*R.A.M.*, viii, p. 701; xi, p. 682; xiii, p. 322]

over sublimed (flowers of sulphur) for plant-protective purposes, the writer ascertained by further tests that both types show an equal capacity for sulphur-dioxide production in sunlight, hence the greater efficacy of the former is attributable to the fineness of its particles enabling it to spread over the leaves in a film.

It is considered to be clear from these investigations that the observed fungicidal action of sulphur is primarily a function of the sulphur dioxide released under the influence of the sun's rays. However, whether sulphurous acid represents the final stage of fungicidal efficacy or whether the process of oxidation continues until sulphur trioxide is produced remains an open question.

A Resolution of the Fourth International Technical and Chemical Congress of Agricultural Industries.—*Int. Bull. Pl. Prot.*, ix, 11, p. 267, 1935.

The following resolution was adopted by the Fourth International Technical and Chemical Congress of Agricultural Industries [held in Brussels from 15th to 28th July, 1935]: 'That an international organization should be established for the study of the standardization of fungicides and insecticides utilized for the protection of industrial plants.'

MORSTATT (H.). **Bibliographie der Pflanzenschutzliteratur: das Jahr 1934.** [Bibliography of plant protection literature for the year 1934.]—*Arb. biol. Reichsanst. Land- u. Forstw., Berl.-Dahl.*, 302 pp., 1935.

This bibliography of German and foreign literature published during 1934 on various aspects of plant protection is compiled on the usual lines [*R.A.M.*, xiv, p. 324].

LEACH (J. G.). **Insects in relation to plant diseases.**—*Bot. Rev.*, i, 11, pp. 448–466, 1935.

The writer discusses and illustrates by a number of concrete examples from contemporary literature (the appended bibliography of which comprises 79 titles) various aspects of the connexion between insects and plant diseases under the following headings: the varied relationships of insects and plant diseases; insects and virus diseases; insects and non-parasitic diseases; the biologic and evolutionary significance of the association of insects and plant pathogens; symbiosis between insects and micro-organisms and its significance in plant pathology; the possible role of insects in the origin of new diseases and the extension of old ones; and the future development of research in the field of insects in relation to plant diseases.

SCHWARTZ (W.). **Aufgaben der Chemie im neuen Deutschland. XII. Die Biologie in der Lebensmittelkonservierung.** [Functions of chemistry in the new Germany. XII. Biology in food preservation.] —*Angew. Chem.*, xlviii, 40, pp. 629–632, 1 fig., 2 graphs, 1935.

A general survey is given of modern chemical possibilities in relation to the control of food spoilage by micro-organisms, the losses from

which in Germany are estimated to reach M. 1,200,000,000 to 1,500,000,000 out of a total annual consumption of meat, fish, fruit, vegetables, eggs, milk, and other dairy products of M. 14,300,000,000. Some of the writer's recent work on the protection of meat from fungal infection by storage under appropriate temperature and humidity conditions has been noticed from another source [*R.A.M.*, xiv, p. 633]. In Seiler's (unpublished) experiments the incidence of decay in Berlepsch Golden Pippin apples stored (*a*) in ordinary cellars, (*b*) at a low temperature (3° C.), and (*c*) at 3° C. in an atmosphere consisting of 15 per cent. carbon dioxide and 10 per cent. ozone was 93, 66, and 33 to 37 per cent., respectively.

SCHEFFER (T. C.). **A tube for culturing fungi.**—*Science*, N.S., lxxxii, 2133, pp. 467–468, 1 diag., 1935.

Satisfactory results have been obtained in studies on the temperature and oxygen relations of growth and respiration in wood-destroying fungi by the use of a modified test-tube with a rounded indentation of the wall on one side near the mouth. This permits the tube to be kept horizontal after charging while the agar solidifies in a uniform narrow strip. By means of inlet and outlet tubes introduced through a rubber stopper gas mixtures may be passed over the culture as desired.

STAKMAN (E. C.), LEVINE (M. N.), CHRISTENSEN (J. J.), & ISENBECK (K.). **Die Bestimmung physiologischer Rassen pflanzenpathogener Pilze.** [The determination of physiologic forms of fungi pathogenic to plants.]—*Nova Acta Leop. Carol.*, N.F., xii, 13, pp. 281–336, 5 pl., 1935.

A comprehensive summary, accompanied by 36 tables, is given of the methods in current use for the determination of physiologic forms in the Uredinales, Ustilaginaceae, Erysiphaceae, and a number of miscellaneous fungi parasitic on plants. Most of the literature cited in the bibliographies appended to each section has been noticed from time to time in this *Review*.

BIRKELAND (J. M.). **Further serological studies of plant viruses.**—*Ann. appl. Biol.*, xxii, 4, pp. 719–727, 1935.

In continuation of his serological studies of plant viruses [*R.A.M.*, xiii, p. 545], the author gives a brief, tabulated account of precipitin tests with tomato aucuba mosaic virus (Johnson's tobacco virus 6), cucumber mosaic virus 1, tobacco mosaic virus 1, and tobacco ring spot virus, all of which were propagated in serologically unrelated host plants. The results of the work gave additional evidence that the virus itself acts as an antigen [ibid., xv, p. 118], and reciprocal precipitin experiments indicated that the viruses of cucumber mosaic, tobacco ring spot, and tobacco mosaic are serologically distinct; tobacco mosaic, however, was serologically indistinguishable from both the green and yellow strains of aucuba mosaic virus, and probably also from that of tomato streak [ibid., xv, p. 122]. Attempts to obtain a soluble specific substance from the juice of virus-diseased plants or from healthy tomato gave negative results.

DU TOIT (P. J.). **Viruses.**—*S. Afr. J. Sci.*, xxxii, pp. 696–705, 1935.

This is an address on recent achievements in the exploration of problems surrounding the filterable viruses, discussed under the headings of invisibility, filterability, and difficulty of cultivation on media universally employed for bacterial propagation [*R.A.M.*, xv, p. 168]. With regard to cultivability, however, the organism causing lung sickness of cattle, which for many reasons is correctly classified as a virus, is an exception to the general behaviour of viruses in that it is cultivated with comparative ease in a particular type of broth. Touching on the bacteriophage, the author states his 'belief that the easiest and most satisfactory manner of explaining this phenomenon is to regard bacteriophage as a virus which attacks the lowest-known form of plant life, the bacteria'.

CAPPELLETTI (C.). **Osservazioni sulla germinazione asimbiotica e simbiotica di alcune Orchidee.** [Observations on the asymbiotic and symbiotic germination of some Orchidaceae.]—*Nuovo G. bot. ital.*, N.S., xlii, 2, pp. 436–457, 1 pl., 1935.

When seeds of different hybrids of the Orchidaceae belonging to the genera *Cattleya* and *Cymbidium* were grown on media containing symbiotic fungi of the Orchidaceae (chiefly *Mycelium radicis* and *Hypochnus catonii*) or in which such fungi had been destroyed by heating, similar seed being grown on ordinary media for purposes of comparison, the results obtained showed that while in general the best germination was obtained on living cultures of the symbionts, in many cases the metabolic products of the fungi alone had a beneficial effect on germination and the subsequent appearance of chlorophyll in the protocorms [*R.A.M.*, xv, p. 108]. On ordinary agar the protocorms sometimes did not turn green for over a year. The effect of late symbiosis on protocorms developed asymbiotically was generally very marked; for instance, protocorms of *Cymbidium gottianum* × *C. florinda* over one year old turned green in seven days on living cultures of the symbiont, and in two months on killed mycelium of the symbiotic fungi of *Phalaenopsis* and *Serapias*. For commercial purposes culture on the living mycelium of these fungi is still recommended.

MAGROU (J.). **Essais de cultures des champignons de mycorhizes.** [Culture experiments with mycorrhizal fungi.]—*C. R. Acad. Sci., Paris*, cci, 22, pp. 1038–1039, 1935.

A number of longitudinal sections of *Arum maculatum* roots infected by an endophyte produced non-septate hyphae of the mycorrhizal type in Van Tieghem cells and drops of soil decoction (Molliard's technique) [*R.A.M.*, xiv, p. 247] with or without 1 per cent. starch. As in the natural state, the hyphae fell into three groups, (1) relatively slender (3 μ in diameter), producing sparse, very long, secondary branches; (2) thicker (5 to 10 μ in diameter), irregular, forming numerous ramifications; and (3) voluminous, of nodular aspect, not branched. As a rule the hyphae developing in artificial culture did not exceed 3 mm. in length, but on transference to a mixture of soil decoction and agar one reached 5·6 mm. None produced fructifications,

and it may be assumed that the endophyte, lacking elements indispensable to growth and exposed to external contamination, cannot long subsist independently of the host roots.

VERONA (O.). **Manière de se comporter des micro-organismes vis-à-vis de certaines substances colorantes. Étude particulière sur le vert malachite et sur son application éventuelle en phytothérapie.** [The mode of behaviour of micro-organisms towards certain colouring agents. A study on malachite green in particular, and its eventual application in phytotherapy.]—*Boll. Sez. ital. Soc. int. Microbiol.*, vii, 11, pp. 426–428, 1935.

A study of the effect on over 50 species of bacteria, yeasts, and fungi [which are listed] of adding different colouring agents to the culture medium showed that the most marked growth-inhibiting action was given by malachite green [*R.A.M.*, xiv, p. 765]; the next most effective agent was brilliant green, while gentian violet exercised a slight effect [ibid., xiv, p. 758]. The bacteria were in general more resistant than the fungi. At a concentration of 1 in 100,000 malachite green arrested the germination of spores of *Tilletia levis* [*T. foetens*], *T. caries*, *Ustilago maydis* [*U. zeae*], and *U. tritici*. Solutions of the same agent prevented zoospore formation by *Plasmopara viticola*, but at a strength of 1 in 10,000 this substance had no effect as a spray against the fungus on the vine [ibid., xii, p. 74; xiii, p. 351]. Wheat seed immersed for six hours in malachite green solution at 1 in 10,000 gave a larger yield than untreated seed and seed treated with copper sulphate and lime. The addition to malachite green solution of milk, jelly, dextrin, and molasses did not reduce its fungicidal power, which was increased in the presence of amyl alcohol; the leucobase that formed when suitable amounts of potassium alkali were added to the malachite green was more strongly fungicidal than the original colouring agent.

SAKSENA (R. K.). **Recherches physiologiques et cytologiques sur quelques espèces du genre Pythium.** [Physiological and cytological researches on some species of the genus *Pythium*.]—120 pp., 7 pl., 2 figs., 5 graphs, Paris, Librairie Générale de l'Enseignement, 1935.

A full account is given of a detailed investigation by the author of the physiology and cytology on different media and under various conditions of growth of *Pythium deliense* [*R.A.M.*, xiii, p. 599; xiv, p. 473], *P. de Baryanum*, *P. mamillatum* [ibid., xii, p. 307], and *P. indigoferae*; all the fungi were obtained from Baarn, the first named having been isolated by Meurs from tobacco in Sumatra.

On maize meal agar at 20° C. *P. indigoferae* made the poorest growth, *P. de Baryanum* the best, the other two species being intermediate. At 20° *P. de Baryanum* grew the most rapidly, followed in decreasing order by *P. deliense*, *P. mamillatum*, and *P. indigoferae*. At 30° *P. deliense* made better growth than *P. de Baryanum*, all the species except *P. deliense* showing their maximum growth-rate at this temperature. The minimum, maximum, and optimum growth temperatures for *P. deliense* were, respectively, 10°, about 40° to 45°, and 35°; at temperatures below 10° growth was suspended, but was renewed when the

fungus was transferred to favourable conditions. The organism was killed at 45° after 24 hours.

It was ascertained that ammonia but not nitrates serve as a source of nitrogen for *P. deliense*. The sulphates can be used as sources of sulphur. In the absence of nitrogen *P. deliense* made no growth, and in the absence of sulphur reduced growth. Peptone was a complete nutrient for all four species. The addition of 10 per cent. glucose or maltose or of a large amount of neutral red retarded the growth of *P. deliense*; cod-liver oil favoured growth, small amounts of malt extract retarded it, and 0·5 per cent. tannic acid inhibited it.

On maize meal agar adjusted to different P_H values the growth curve of *P. deliense* showed two maxima, one at P_H 5 and the other at P_H 9, with a minimum between these points at P_H 7; on the acid side growth ceased at P_H 2·9 and on the alkaline at P_H 10·6.

At 30° C. on maize meal agar *P. deliense*, *P. mamillatum*, *P. de Baryanum*, and *P. indigoferae* developed sexual organs in 12 to 18, 48, 72, and 96 hours, respectively. At both low and high temperatures their formation was retarded; they developed in light and dark conditions but not in the absence of oxygen. *P. deliense* formed sexual organs on most media, but peptone, which favoured the vegetative growth of all four species, inhibited their formation. Sexual reproduction was retarded also by malt extract or the absence of ammonia, but was accelerated by cod-liver oil.

All four species hydrolysed peptone solutions with the production of ammonia, an initial P_H value of 5 being changed at 30° C. by *P. deliense*, *P. de Baryanum*, and *P. mamillatum* to 8·3, 7·92, and 7·88, respectively, in 21 days, the corresponding value for *P. indigoferae* being much less altered at 6·01. None of them formed oxalic acid or hydrolysed saccharose, but they all hydrolysed soluble starch, secreting diastases but not invertases.

Though *P. deliense* did not as a rule form sporangia in culture, the formation of these organs at 30° C. was obtained by transferring portions of oat agar cultures to Petri's solution; zoospores were produced on transference to tap-water.

Cytological studies on the species are described in detail.

CARTER (J. C.). **Diffusible nature of the inhibitory agent produced by fungi.**—*Phytopathology*, xxv, 11, pp. 1031–1034, 1935.

Potato dextrose agar, staled by the combined growth of *Helminthosporium sativum* and a bacterium herein referred to as 9a2, was found to inhibit the further growth of the fungus [*R.A.M.*, xiv, pp. 387, 464]. The fact that the preventive action was exercised by portions of sterile agar taken from between the two organisms and placed a few mm. from the growing fungus is considered to establish the diffusible nature of the inhibitory agent, which was confirmed by obtaining the diffusion of the agent into water. The substance in question is thermostable and retains its growth-inhibiting properties after sterilization in an autoclave. The bacterium was shown to be the more potent of the two partners in the formation of the anti-fungal product, which also proved antagonistic to *H.* [*Curvularia*] *inaequalis*.

FOLSOM (D.). **Potato virous diseases in 1934.**—*Amer. Potato J.*, xii, 11, pp. 304–310, 1935.

A bibliography, compiled on the lines of previous surveys and comprising 119 titles, is given of contemporary American, European, and Colonial literature on potato virus diseases [*R.A.M.*, xiv, p. 54].

Ziekten en beschadigingen van het Aardappelloof. [Diseases and pests of Potato foliage.]—*Versl. PlZiekt. Dienst Wageningen* 6 (7th Ed.), 32 pp., 9 pl. (1 col.), 1935.

In this revised edition of an earlier pamphlet of the same series [*R.A.M.*, vii, p. 459] semi-popular notes are given on the following diseases affecting potato foliage in Holland: leaf roll, mosaic (including crinkle and aucuba), streak, *Rhizoctonia* (*Hypochnus* [*Corticium*]) *solani*, *Verticillium albo-atrum*, *Alternaria solani* [ibid., xiii, p. 54], *Phytophthora infestans* [ibid., xiv, p. 715], *Cercospora concors* (observed for the first time in 1935 producing on the upper leaf surfaces brownish-yellow, purple-bordered spots) [ibid., xiv, p. 741], wart disease (*Synchytrium endobioticum*), *Sclerotinia libertiana* [*S. sclerotiorum*], and blackleg (*Bacillus atrosepticus*) [*B. phytophthorus*].

KÖHLER (E.). **Erfahrungen beim feldmässigen Abbau von künstlich blattrollinfizierten Kartoffeln (Sorte Kl.-Sp. Wohltmann). (Untersuchungen über die Viruskrankheiten der Kartoffel. V. Mitteilung.)** [Experimental observations on the degeneration under field conditions of Potatoes (Kl.-Sp. Wohltmann variety) artificially infected by leaf roll. (Investigations on the virus diseases of the Potato. Note V.)]—*Arb. biol. Reichsanst. Land- u. Forstw., Berl.-Dahl.*, xxi, 4, pp. 517–529, 2 pl., 1935.

Continuing his studies on the virus diseases of potatoes [*R.A.M.*, xiv, p. 388; xv, p. 43], the writer gives a fully tabulated account of his experimental observations on the incidence of 'degeneration' in two localities, Mechow (Brandenburg) and Marienfelde (Berlin), both of which enjoy a high reputation for health as understood in connexion with the ecological degeneration theory [ibid., xiv, p. 785].

In 1934 virus diseases developed spontaneously in both places, Marienfelde suffering particularly severely from the virulent Y-streak [ibid., xiv, p. 649] and also showing a higher total of all infections than Mechow, where the relatively innocuous 'rolling mosaic' referred to below predominated. Leaf roll was experimentally transmitted among the progeny by means of aphids (*Myzus persicae*) in both places, the infected plants being heavily damaged and showing marked evidence of 'degeneration'. The (ecologically) healthier conditions prevailing at Mechow failed to reduce the amount of leaf roll, a fact considered to lend further weight to the theory that this disease is a primary factor in 'degeneration'. On the other hand, the tardy germination of the tubers grown at Marienfelde as compared with that of the Mechow produce may be regarded as a purely physiological after-effect of the habitat.

For the first time in Germany a mosaic virus was detected on the potatoes used in these trials which was not transmissible to tobacco by

means of expressed juice. It appears to be related to the American leaf-rolling mosaic [ibid., xi, p. 667] and the English paracrinkle [ibid., xiii, pp. 48, 321]; further studies on its nature have been initiated. Conspicuous features of the disorder are the upright growth, softness, mottling, and upward rolling of the leaves, the under sides of which show extensive anthocyanin formation.

Ring mosaic [ibid., xiv, p. 388] occurred in various forms and degrees of virulence in both localities.

KLAPP (E.). **Zusammenhänge von Standortseigenschaften, Viruserkrankung und Nachbauertrag der Kartoffel.** [Connexions between ecological properties, virus disease, and progeny yield of the Potato.]—*Pflanzenbau*, xii, 5, pp. 163–191, 6 figs., 1935.

Ecological influences have been shown by the writer's extensive studies in Germany to induce modifications of various kinds in the constitution of the potato, but in the absence of virus diseases [see preceding abstract] such changes are as a rule reversible. True degeneration, on the other hand, is irreversible and here the effects of the associated viruses play a decisive part. In the present series of experiments the lowest yields in the first generation from seed were consistently derived from crops with severe virus infection. Referring to the problem of the relative importance in the etiology of degeneration of ecological conditions and virus infections, the writer considers that the dissemination and activity of the latter are entirely dependent on the former. In this sense, therefore, the viruses cannot be regarded as the primary cause of degeneration, though they certainly are intimately concerned in the progress and intensification of the adverse changes already initiated by conditions inherent in the place of growth. In this connexion it is pointed out that, at any rate in the case of mildly infected material, the avoidance of injurious ecological influences greatly alleviates the symptoms and in fact may render them negligible from a practical standpoint. To sum up, the writer thinks that the exclusion of deleterious ecological and nutritional influences is at least as important in the production of healthy seed as the suppression of viruses by stringent selection on the part of breeders and growers.

PULLEN (A. R.) & WASSERMANN (J.). **Some observations on Potato 'degeneration' in South Africa.**—*S. Afr. J. Sci.*, xxxii, pp. 271–279, 1 pl., 1935.

Potato deterioration is stated to be common in South Africa, necessitating the constant importation of fresh stocks from overseas, especially of Up-to-Date from Scotland. An examination of the Transvaal potato fields suggests that virus diseases are far less common than might be expected. Typical leaf roll has not been detected but an apical leaf roll occurs fairly generally. It causes a rolling of the basal portion of the smaller leaflets on young leaves, the terminal growth is checked, and the lower shoots are stimulated, giving the plant a pyramidal shape. The leaves develop a reddish or purplish colour and the tubers are reduced in size. Other diseases present are giant hill [*R.A.M.*, xiii, p. 722], spindling sprout [ibid., x, p. 201; xiv, p. 715], spindle tuber [ibid., xiv, p. 784], and yellows (? mosaic) characterized by a generalized

chlorosis and stunted, unthrifty plants. Spindle tuber occurs in two forms, i.e., the typical one and the so-called 'violet' spindle (a local name, descriptive of the general appearance of the growing plant), in which the leaflets, especially the terminal, are broadened and the whole plant is somewhat stunted and compact, though erect. There are many slender stems with swollen nodes. The tubers are elongated, but not pointed at one end as in true spindle tuber, and abnormally few and small, and the eyes are crowded at the bud end. This disorder appears to be confined to generations following the first from imported seed.

Attention is drawn to the local prevalence of the so-called 'wild' potatoes, a description of two forms of which, viz., the true pink-eyed and No. 2 (white-eyed), is given. These bear a large number of seed-size tubers but are considered to be genuine rogues and not systemic virus-diseased plants. Careful seed selection, followed by hill selection of normal plants, and rogueing are essential to the control of degeneration.

TSCHERNYSCHOVA (Mme O. P.). **Schädlichkeit von Viruskrankheiten der Kartoffel.** [Damage from Potato virus diseases.]—*Arb. ForschInst. Kartoff., Moskau, 1935*, pp. 59–84, 1935. [Russian. Abs. in *Bot. Zbl.*, xxvii, 5–6, pp. 170–171, 1935.]

Mild mosaic is stated to be generally of a very innocuous character in U.S.S.R., but in the Centifolia and Great Scot varieties losses of 29 and 20·65 per cent. at harvesting were attributed to this source. Crinkle, on the other hand, is widespread and very severe [*R.A.M.*, vii, p. 263], except on late varieties. The adverse effects of mosaic are expressed in a reduction in the number of tubers and (in early and medium-early varieties) in their size, the starch content being scarcely influenced. In the case of medium-late and late varieties virus diseases may occasionally cause an increase in the weight of the tubers.

MARCHIONATTO (J. B.) & MILLÁN (R.). **Certificación de la 'semilla' de Papa.** [Potato 'seed' certification.]—*Bol. Minist. Agric., B. Aires*, xxxvi, 4, pp. 301–312, 9 col. pl., 1934. [Received February, 1936.]

Following a brief explanatory account of the introduction of quarantine legislation for the exclusion of potato diseases (with special reference to those of virus origin) in Brazil [*R.A.M.*, viii, p. 815; xv, p. 64], Uruguay [ibid., xiii, p. 672], and the Argentine (where these disorders are stated to be assuming great importance), the writers append copies of the relevant decrees issued by the three Republics.

The following are among the provisions of the Argentine Order, issued 24th February and amplified 6th November, 1934, governing the production of certified seed potatoes in that country. Tubers used as seed should be certified stock selected from varieties of known resistance to virus diseases and as a precautionary measure they should be disinfected for one hour in mercuric chloride 1 in 1,000. In districts where *Phytophthora infestans* is permanently established the crops should be periodically sprayed with 1 per cent. Bordeaux mixture, while at the same time aphids should be combated with nicotine and other insects with arsenical preparations to prevent the development of viruses.

Three inspections are made of all plantings registered for certification, (1) at flowering, (2) before maturity, and (3) during harvest. At (1) the

limits of tolerance in respect of the various diseases are up to 5 per cent. for mosaic and yellow dwarf [ibid., xv, p. 42], and up to 10 per cent. for other parasitic maladies (excluding *P. infestans*); infected plants in stands falling within these limits of tolerance must be eradicated and burnt under official supervision. At (2) the maximum for all parasitic diseases and 'viruses' is fixed at 5 per cent., and the detection of severe attacks of a virus disorder in plantings contiguous or in close proximity to those submitted for certification disqualifies the latter for seed purposes without further inspection. At (3) the rigorous selection of healthy tubers is enforced, the maximum tolerance for scab (*Actinomyces scabies*) and black scurf (*Corticium vagum*) [*C. solani*] being 5 per cent., while certification is refused in the case of any trace of bacterial wet rot. Health certificates are supplied for consignments of seed potatoes for foreign countries.

STEWART (F. C.). **A Potato seed plat roguing experiment.**—*Bull. N.Y. St. agric. Exp. Sta.* 655, 10 pp., 1935.

Through the use of an isolated and carefully rogued seed plot a grower in northern New York has succeeded during nine consecutive years (1924 to 1932) in producing a high grade of certified Green Mountain potatoes from fields of six to eight acres, the total incidence of virus diseases (mosaic and leaf roll) detected at two inspections in the latter year being 0·4 per cent. compared with 2·6 per cent. in the former [cf. preceding abstract]. The favourable outcome of this experiment is attributed mainly to (1) the suitable position of the plot in a region where high temperatures are rare and aphids seldom plentiful on potatoes; (2) earliness and thoroughness of the roguing operations; and (3) use of the tuber-unit method of planting [*R.A.M.*, xiv, p. 714].

PASINETTI (L.). **Ricerche istologiche sulla 'maculatura ferruginosa' (Eisenfleckigkeit) dei tuberi di Patata.** [Histological researches on rust spot (Eisenfleckigkeit) of Potato tubers.—*Riv. Pat. veg.*, xxv, 5–6, pp. 185–227, 21 figs., 1935.

Cytological and histological studies [which are described in detail] showed that 'Eisenfleckigkeit' disease of potato tubers [*R.A.M.*, xv, p. 111, and next abstracts] falls into nine distinct stages. The first stage is marked by slight darkening of the wall of one cell in the healthy parenchyma, beginning at a corner and spreading for a short distance along the cell wall. The entire content of the cell appears to be completely normal. In the second stage rod-shaped granulations are seen in the protoplasm, which collects against the cell walls, leaving up to six or seven vacuoles in the middle; the discoloration of the wall may affect two or three corners of the cell. The third stage is characterized by the star-shaped appearance assumed by the affected cells, as a result of marked discoloration at various points; the cell wall swells at these places and the protoplasm aggregates towards them. In the fourth stage the discoloration spreads over the whole of the cell wall and the protoplasm in the affected cell or cells coagulates and solidifies. This is followed, in the fifth stage, by abnormal division in the cells of the healthy tissues surrounding the group of diseased cells. The sixth stage is characterized by the formation of more groups of affected cells,

separated from other similar groups and incorporated in the mass of dividing cells. In the seventh stage the central affected groups become scattered by the growth of the tissues. The eighth stage is marked by the complete alteration of the cell wall and the cytoplasm and the extension of the disease to a large area of the parenchyma. Finally, a periderm is formed cutting off the diseased from the healthy part, followed by the suberization of the walls of a large part of the cells composing the affected area.

The author's observations failed to establish the presence in affected tissues of any parasitic organism and he concludes that 'Eisenfleckigkeit' is a physiological condition due to unfavourable environmental factors.

SCHLUMBERGER (O.). **Die Krankheitswiderstandsfähigkeit der Kartoffel.** [The resistance to disease of the Potato.]—*Mitt. Landw., Berl.*, 1, 47, pp. 1013–1014, 1935.

Absolute resistance to disease in potatoes appears to be confined to wart disease [*Synchytrium endobioticum*: cf. *R.A.M.*, xiv, p. 55], the capacity to withstand infection in all other cases being conditional. Thus, varieties resistant to scab [*Actinomyces scabies*], 'Eisenfleckigkeit' [see preceding and next abstracts], *Rhizoctonia* [*Corticium solani*], *Bacillus phytophthorus*, and late blight [*Phytophthora infestans*] under appropriate environmental conditions may succumb to these disorders in an adverse environment. The breeding of varieties resistant to *P. infestans* has been further complicated by the detection of various physiologic forms of the fungus [ibid., xiv, p. 390].

EHRKE (G.). **Untersuchungen uber die Stoffwechselvorgänge in eisenfleckigen Kartoffeln.** [Investigations on the metabolic processes in 'eisenfleckig' Potatoes.]—*Angew. Bot.*, xvii, 6, pp. 453–483, 6 figs., 1 diag., 11 graphs, 1935.

The outstanding results of the writer's researches on the metabolic aspects of 'Eisenfleckigkeit' in potatoes, which are here presented in a comprehensive, fully tabulated form, have already been noticed from another source [*R.A.M.*, xiv, p. 717, and cf. preceding abstracts].

ROCHLINA (E[MILIA] J.). **On some peculiarities of late blight resistant Potato varieties.**—*Arb. ForschInst. Kartoff., Moskau, 1935*, pp. 85–96, 1935. [Russian, with English summary. Abs. in *Bot. Zbl.*, xxvii, 5–6, p. 171, 1935].

The chemical constituents of the host, especially solanin, have been found to influence the varietal reaction of potatoes to late blight (*Phytophthora*) [*infestans*] in U.S.S.R. [*R.A.M.*, xiii, pp. 52, 468], the amount of this substance in old tubers of resistant varieties being larger than that in similar material of susceptible sorts.

DE BRUIJN (HELENA L. G.). **Het schurftvraagstuk van mycologische zijde beteken.** [The scab problem considered under the mycological aspect.]—Reprinted from *Landbouwk. Tijdschr., Wageningen*, xlvii, 579, 8 pp., 5 figs., 1935. [English summary.]

The outcome of the writer's inoculation experiments confirmed those of Millard and Burr [*R.A.M.*, vi, p. 179] and Wollenweber (*Arb.

ForschInst. Kartoff., Berl., ii, 1920) in respect of the capacity for different isolations of *Actinomyces* [*scabies*] from diseased potatoes to cause divergent types of scab on the Bintje variety. One strain capable of causing severe symptoms was grown by a collaborator in a synthetic solution mixed with the sap of tubers of different varieties (Bintje, Erdgold, Eigenheimer, and Alpha) according to Kiessling's method [*R.A.M.*, xiii, p. 259]. The hydrogen-ion concentration of the solution tended to become more alkaline with the age of the tubers in the case of Eigenheimer and Alpha, and the growth of the fungus was correspondingly more luxuriant in the 20th July and 20th September series than in that of 20th June. The Bintje sap was the most alkaline (P_H 6·3) from the outset and underwent little change (to P_H 6·5) while the results obtained with Erdgold were variable, like those commonly given by this variety in practice [ibid., xiii, p. 50]. The best growth took place on the sap of the susceptible Bintje variety, while hardly any occurred on that of young tubers of the resistant Alpha, confirming the importance of physiological factors in scab resistance.

FITCH (C. L.). **The geography of scab in the United States.**—*Amer. Potato J.*, xii, 11, pp. 310–316, 1935.

The following factors would appear, from a survey of the United States potato-growing areas from the standpoint of scab [*Actinomyces scabies*] prevalence [*R.A.M.*, xv, p. 172], to be primarily concerned in the presence or absence of the disease; the extent of soil or seed infestation; the possibility and degree of tuber infection as influenced by (*a*) the variety and (*b*) early season weather conditions; the degree of aeration in relation to (*a*) water in the soil tending to displace air or hinder its entrance, (*b*) soil texture, and (*c*) type of subsoil; soil reaction as determined by (*a*) lime and other alkalis present, and (*b*) acid production with ammonium sulphate and sulphur; and soil temperature as the outcome of (*a*) air temperature and sunshine, and (*b*) moisture in soil and subsoil and the ground water level.

ROJALIN (L. B.). **The effect of plant nutrition on the resistance of different Potato varieties to the bacterial ring disease.**—*Arb. Forsch-Inst. Kartoff., Moskau, 1935*, pp. 1–21, 1935. [Russian, with English summary. Abs. in *Bot. Zbl.*, xxvii, 5–6, p. 170, 1935.]

The vital activity of the bacteria responsible for ring rot of potatoes [*Bacterium sepedonicum*: *R.A.M.* xi, p. 670] involves a loss of glucose in the region of the vascular bundles. The development of the disease in the field coincides with a maximum accumulation of glucose in the stems, and varieties resistant to ring rot are characterized by the slowness with which they store up glucose in the tubers. The presence in the soil of relatively large quantities of nitrogen and phosphorus induces an unduly rapid accumulation of glucose in the stems and tubers with a consequent decline in resistance to ring rot. In sandy soils the storage of glucose by the plants may be retarded and resistance to ring rot correspondingly increased by manuring with potash. Potatoes cultivated in black, fertile soils show a natural resistance to the disease associated with slow glucose accumulation in comparison with plants grown on poor sand or peat. Under the latter conditions intensive

applications of potash for two to three years, combined with the removal of infected plants, are essential for the control of ring rot.

Săvulescu (T.). **Rumania: non-existence of wart disease of Potatoes in the country.**—*Int. Bull. Pl. Prot.*, ix, 11, p. 250, 1935.

Rumania is stated to be free from infestation by potato wart disease (*Synchytrium endobioticum*), so that tubers grown in the country may safely be purchased for use elsewhere, more especially since all consignments destined for export are subject to official inspection and accompanied by duly authenticated health certificates.

Chamberlain (E. E.). **Corticium-disease of Potatoes. The effect of crop rotation on its persistence in the soil.**—*N.Z. J. Agric.*, li, 5, pp. 287–289, 1 fig., 1935.

The final result in 1934 of the experiments started in 1928 [at Palmerston North: *R.A.M.*, xi, p. 201; cf. also pp. 260, 534] to determine the effect of crop rotation on the persistence in the soil of the *Corticium vagum* [*C. solani*] disease of the potato in New Zealand, showed that rotation of two or three years with cereals, *Brassica* spp., and legumes tended to reduce the amount of infection with the fungus in the soil. The *Brassica* spp. and legumes were slightly more effective in this respect than the cereals, but grass gave a greater and more consistent reduction in soil infection (73, 56, and 3 per cent. infection after 1, 2, and 3 years' rotation, respectively). In the final plot which remained under grass for 4 years the disease was practically eliminated in the soil, since out of 160 potato plants raised on it from tubers treated by the acidulated mercuric chloride method [loc. cit.] only one became infected with *C. solani*.

Leach (J. G.) & Darling (H.). **Symptoms of Potato wilt in Minnesota this year.**—*Plant Dis. Reptr*, xix, 19, pp. 299–302, 1935. [Mimeographed.]

After making satisfactory initial growth, potato plants in west-central Minnesota showed very unusual symptoms during the second week in July, consisting of an upward rolling and reddening of the leaves, abnormal development of the aerial shoots, and a profusion of aerial tubers in the leaf axils, especially near the base. The incidence of the trouble increased rapidly until in many fields up to 50 per cent. infection was counted. A new virus disease was at first suspected, but microscopic examination revealed the constant presence in the vascular bundles of a species of *Fusarium*, probably *F. oxysporum*, though the general appearance of the affected plants was suggestive of attack by *F. eumartii* [*F. solani* var. *eumartii*: *R.A.M.*, xiii, p. 651]. There was an extensive accumulation of starch in all the aerial parts.

Fusarium wilts are stated to have been generally increasing in prevalence in the State during the last 4 years, and in 1934 the estimated incidence of the wilt in potato was 4 per cent., the highest recorded for 15 years. From a consideration of the meteorological data prevailing during the summer of 1935 it would appear that soil temperatures were sufficiently high to promote abundant infection, the typical lethal effects of which were mitigated, however, by heavy rainfall and high humidity.

The production of red pigment, the development of axillary shoots, and the formation of aerial tubers are held to be sufficiently explained by the excessive accumulation in the vascular system of starch which could not be conveyed to the tubers owing to obstruction by the fungus involved.

VAN SCHREVEN (D. A.). **Physiologische proeven met de Aardappelplant.** [Physiological experiments on the Potato plant.]—Reprinted from *Landbouwk. Tijdschr.*, *Wageningen*, xlvii, 579, 23 pp., 8 figs., 1935. [English summary.]

A full account is given of the writer's experiments to determine the effects on potato plants in water and sand cultures of a deficiency (and in a few cases also of an excess) of some important nutrient elements.

The symptoms of nitrogen shortage were a uniform pale to yellowish-green coloration of the plants, restricted development, abnormal elongation of the roots, and small tubers. Phosphorus deficiency is expressed by an upward tendency of the petioles, leaflets (which are unusually small and dark), and leaf margins, stiffness of the plants, and poor root and tuber growth. Potash shortage, on the other hand, leads to a drooping of the leaflets and leaf margins, a dark green, subsequently bronze or yellow tinge being imparted to the foliage, the interveinal tissue of which is much raised; there is a decrease in the ratio of length to breadth, shortening of the stolons, poor root and tuber development, and in severe cases, necrosis of the leaf margins and stem and petiole discoloration [*R.A.M.*, xv, p. 46].

The effect of magnesium deficiency [ibid., xiv, p. 649] on President plants was very severe. Chlorosis originated at the tips of the basal leaves, gradually spread over the surface, and progressed upwards to the top of the plant, the youngest leaves of which, however, remained green. The older leaves died prematurely. In severe cases the chlorotic tissue was almost pure white, but usually it is pale yellow and abnormally raised, while the leaf tips and margins droop. The symptoms were aggravated by an excessive supply of nitrogen.

The first indication of calcium deficiency is a pale green band along the margins of the young leaves of the bud, which prevents the normal development of the latter and often produces a wrinkled appearance. In severe cases the young leaves at the top of the plant remain folded and the whole top dies. The medullary region of the tubers shows a necrotic spotting closely agreeing with that described by Miss Schwarz from the Dutch East Indies under the name of 'rusty spot', for which it is proposed to substitute the term 'medullary necrosis' as less likely to cause confusion [ibid., xiv, p. 253].

Boron deficiency is characterized by dying-off of the growing points, curling (generally upwards) of the leaf margins and thickening of the surface, and a generally chlorotic appearance. In extreme cases anthocyanin is formed, the internodes are shortened, giving a short, bushy aspect to the plants, and the petioles are very brittle. The leaf tips and margins die prematurely, and at an advanced stage the roots are short, thick, and brown, and the whole system looks stunted owing to the profuse development, after the death of the root tips, of secondary rootlets which frequently cease growth soon after emergence. The

tubers are abnormally small and often split across the surface. The apical cells and procambium at the growing points become discoloured and necrotic, the symptoms subsequently extending to the stem, axillary buds, and interior of the lateral shoots. The stelar structure may be specially severely affected. The cells of the cambium, phloem, and parenchyma are often deformed by extension and compression, and whole groups may disintegrate into a dark brown mass, whereas the xylem is usually poorly developed. In treated glass sand cultures the addition of 3·5 mg. boric acid per l. sufficed to prevent the above-mentioned symptoms, whereas in the case of heart rot of beet it is necessary to apply the same substance at the rate of 40 to 50 mg. [ibid., xv, p. 189].

Manganese deficiency is expressed by a pale green to chlorotic tinting of the interveinal foliar tissue, the tops of the stems, and the shoots, followed by the continuous development of numerous brown spots along the veins. Tuber formation is arrested. An excess of this element in the same variety leads to necrotic spotting of the foliage, accompanied in severe cases by patches and streaks on the veins, petioles, and stems. Iron deficiency causes slight chlorosis of the foliage, the affected tissue becoming in extreme cases almost pure white.

Copper sulphate in excess results in scorching and collapse of the plants, and an excess of sodium chloride (0·5 per cent.) induces chlorosis, followed by necrosis and death, of the margins of the basal leaves.

Costantin (J.) & Magrou (J.). **Sur les mycorhizes de la Pomme de terre.** [On Potato mycorrhiza.]—*Ann. Sci. nat.*, *Bot.*, Sér. X, xvii, 1, pp. 37–50, 2 pl., 1935.

After referring to their previous observations on the production of a typical endophytic mycorrhiza in the roots of two potato plants raised from true seed in virgin soil in the Pyrenees at an altitude of 1,400 m. [*R.A.M.*, vi, p. 434; xiii, p. 536, and next abstracts], the authors state that a repetition of the experiment at altitudes of 560 and 1,400 m. in 1934 with seedlings from four potato varieties gave similar results, mycorrhizal development being entirely absent in ordinary, manured soil and either abundant or absent, depending on the individual plants, in virgin soil. Potato plants grown from tubers in the same plots in ordinary soil showed abundant root infestation by the mycorrhizal fungus [ibid., xiv, p. 602]. Endophytic mycelium of both the inter- and intracellular types was found.

Costantin (J.). **Quelques résultats des cultures de Fontainebleau (1934). Solanum tuberosum.** [Some results with the sowings at Fontainebleau (1934). *Solanum tuberosum.*]—*Ann. Sci. nat.*, *Bot.*, Sér. X, xvii, 1, pp. 59–63, 1935.

Tubers of a seedling of the Maréchal-Franchet-d'Esperey potato variety grown at an altitude of 1,400 m. gave lower yields the following year in the plains than at altitudes of 560 and 1,400 m. [see preceding and next abstracts]. The beneficial influence of altitude was also manifested by partially degenerated tubers of the Bevelander variety, raised at 1,650 m., when grown at Fontainebleau. Both healthy and degenerated tubers of different varieties raised in the Pyrenees at

1,400 m. gave much better yields at Fontainebleau than corresponding tubers raised at 560 m. The yield from nineteen tubers raised at an altitude of 2,860 m. in 1933, and grown at Fontainebleau in 1934, averaged only 305 gm. The original stock was healthy and the unsatisfactory result is attributed to 'climatic degeneration' due to the very high altitude.

Costantin (J.). **La rusticité des plantes alpestres.** [The hardiness of mountain-grown plants.]—*Ann. Sci. nat.*, *Bot.*, Sér. X, xvii, 1, pp. 65–80, 3 figs., 1935.

In discussing the acclimatization of potato plants to mountain conditions, the author suspects that the presence of the mycorrhizal fungus in virgin soil [see preceding abstracts] may account for the better growth of tubers obtained from true seedlings in this soil as compared with ordinary soil, at altitudes of 560 and 1,400 m. in the Pyrenees. Virgin soil also appeared to increase the yield of true seedlings grown at 560 and 1,400 m. without recourse to previous planting at high altitudes; in ordinary soil scarcely any tubers were found at 560 m. but a moderate quantity at 1,400, indicating that ordinary soil may contain mycorrhizal fungi abundantly at 1,400 m. but only very sparsely at 560 m. The sudden adaptation to an altitude of 1,400 m. observed in certain seedlings is attributed to the presence of mycorrhizal fungi.

Fawcett (G. L.). **Notas sobre nuevas plagas del Arroz en Tucumán.** [Notes on new Rice pests in Tucumán.]—*Circ. Estác. exp. agríc. Tucumán* 45, 3 pp., 1 fig., 1935.

Rice leaves bearing small, black, sometimes confluent spots, mostly on the upper side, were submitted for examination to E. C. Tullis, who identified the agent of the disorder as *Entyloma oryzae* [*R.A.M.*, xiv, p. 498]. The disease, which now appears to be widespread in Tucumán, is probably of recent introduction; it affects chiefly the basal leaves of irrigated (as opposed to dry land) rice.

Aoki (Y.). **On physiologic specialization in the Rice blast fungus, Piricularia oryzae Br. et Cav.**—*Ann. phytopath. Soc. Japan*, v, 2, pp. 107–120, 1935. [Japanese, with English summary.]

On the basis of four important characteristics, namely, formation of aerial hyphae, extent of sporulation, coloration of the submerged mycelium in potato decoction agar with 1 per cent. saccharose, and growth of the submerged mycelium in three synthetic agar media with varying amounts of glucose, the writer divided 23 culture strains of *Piricularia oryzae*, the agent of rice blast in Japan [*R.A.M.*, xiv, p. 653], into 14 distinct types. A comparison was made of the conidial dimensions of 16 culture strains representing 8 types on potato decoction agar with 1 per cent. saccharose, the results of which revealed no outstanding differences between them.

Blauser (I. P.). **Soil sterilization by electricity.**—*Agric. Engng, St Joseph, Mich.*, xvi, 11, pp. 436–438, 440, 2 diags., 4 graphs, 1935.

Two different methods of applying electricity to soil sterilization are stated to be employed in Ohio, one involving the use of insulated electric

heating elements in a soil container, the advantages of which appear to be more than offset by its unduly high initial and operating costs and very uneven heating of the soil, and the resistance type [*R.A.M.*, xiv, p. 778], a simple and inexpensive method exposed to the drawbacks of variability of electric demand and the need for extreme care in operation. By the use of two horizontal electrodes placed one on top of the other in the container it has been possible to overcome certain difficulties met with in the installation of vertical electrodes which tended to cause uneven heating. The soil sterilizer for two electrodes, 36 by 24 in., has a standard soil depth of 10 in. In a typical case of a sandy loam soil with a 22·5 per cent. moisture content by weight the initial demand was 2·3 kw., increasing to 10·2 kw. with a rise in temperature to 210° F. The amount of electricity consumed in soil sterilization by the resistance method averages about 1 kw. hour per cu. ft. at 180°. There are two different ways of curtailing the time required to reach a temperature of 210° (usually 1 to 1½ but up to 5 hours), viz., decreasing the depth of the soil, which would necessitate a readjustment of the electrodes, or treating the soil with a light application (0·025 to 0·05 per cent.) of ammonium sulphate or potassium chloride.

Several makes of soil sterilizer using heating elements are available with capacities ranging from ⅓ to 1 cu. yd., demands from 1,250 to 5,000 kw., and prices from $85 to 135. Tests have been made on two such sterilizers with the minimum and maximum capacities and demands. After nine hours' working, the latter was found to have used 45 kw. hours and the minimum and maximum temperatures were 158° and over 300°, respectively. After ten hours, the smaller apparatus had used 12·5 kw. hours and the minimum and maximum temperatures were 163° and 298°, respectively.

In tests (with A. L. Pierstorff) on the minimum temperature required to kill the tomato wilt fungus (*Fusarium*) [*bulbigenum* var. *lycopersici*], satisfactory results were obtained at 150° [cf. ibid., xiii, p. 195].

ORTON (C. R.). **The dissociation of Fusarium in soil.**—*Bull. Torrey bot. Cl.*, lxii, 7, pp. 413–418, 4 pl., 1935.

The author gives a full account of his studies on the dissociation of *Fusarium* [*bulbigenum* var.] *niveum*, the cause of watermelon wilt, in the soil, an abstract of which has already been noticed from another source [*R.A.M.*, xiv, p. 420; cf. also ibid., xiii, p. 560]. Besides *F. bulbigenum* var. *niveum*, the author also studied three strains of *F. vasinfectum* from cotton, and one of *F.* [*bulbigenum* var.] *tracheiphilum*. The last-named exhibited no dissociation throughout the experiments, the same also applying to two strains of *F. vasinfectum*, a third strain of which, however, produced two distinct dissociants.

KILLIAN (C.) & FEHÉR (D.). **Recherches sur phénomènes microbiologiques des sols sahariens.** [Studies on the microbiological phenomena of Saharan soils.]—*Ann. Inst. Pasteur*, lv, 5, pp. 573–622, 13 figs., 8 graphs, 1 map, 1935.

An exhaustive, fully tabulated account is given of the writers' studies on the microbiology of Saharan soils in the vicinity of the Laboratory of Desert Biology at Beni-Ounif. Among the organisms isolated were the

following: eight species of *Actinomyces*, including *A. cellulosae* [*R.A.M.*, xiv, p. 698] and three new ones, *Mucor brevipes*, *M. mucedo*, *M. racemosus* [ibid., xiv, pp. 247, 655], *M. spinosus*, *Rhizopus nigricans*, *R. microsporus*, *Thamnidium elegans*, *Cephalosporium acremonium* [see above, p. 220], *Trichoderma lignorum*, *T. koningii* [ibid., xiv, p. 551], *Aspergillus candidus*, *A. flavus*, *A. fumigatus*, *A. niger*, *A. phaeocephalus*, *A. variabilis*, *Penicillium candidum*, *P. crustaceum*, *P. silvaticum*, *Sporotrichum laxum*, *S. luteo-album*, *S. polysporum*, *Trichothecium roseum*, *Periconia atra*, *P. ellipsospora*, *Trichosporium fuscum*, *Haplographium chlorocephalum*, *Helminthosporium folliculatum*, and *Macrosporium commune* [?*Pleospora herbarum*].

Notwithstanding the minimal water content of the desert soils and the excessively high temperatures to which they are exposed, the fungi and other micro-organisms contained therein were shown by respiration experiments to be in a state of full activity. It should therefore be possible, by irrigation and other cultural measures, to dispense with the costly synthetic fertilizers hitherto deemed essential in these regions, more especially as the phosphorus and (in general) the potash contents were found to be amply sufficient for the normal requirements of cultivation.

SALMON (E. S.) & WARE (W. M.). **The chlorotic disease of the Hop. IV. Transmission by seed.**—*Ann. appl. Biol.*, xxii, 4, pp. 728–730, 1 pl., 1935.

The authors consider that the transmission through the seed of the chlorotic disease of the hop [*R.A.M.*, xii, p. 242] was demonstrated by their experiments, in which hop seeds collected in 1932 from naturally diseased plants were sown early next year in seed-boxes. Of the 228 hop seedlings thus raised, 28 (12·3 per cent.) showed the disease in June, 1933, and among the remaining 196 apparently healthy plants (four plants were discarded), 33 (16·8 per cent.) developed the chlorotic disease in 1934. Thus a total of 61 plants (26·8 per cent.) eventually showed chlorotic symptoms.

SALGUES (R.). **Les modifications biochimiques en phytopathologie. L'essence de lavande officinale des plantes parasitées par Septoria lavandulae Desm.** [Biochemical modifications in phytopathology. Pharmaceutical essence of Lavender from plants parasitized by *Septoria lavandulae* Desm.]—*C. R. Soc. Biol., Paris*, cxx, 35, pp. 703–704, 1935.

Chemical analyses were made of the oil produced by lavender plants attacked by *Septoria lavandulae* [*R.A.M.*, v, p. 278], the agent of irregularly circular, white, red-bordered, prominent foliar lesions, and of that from healthy individuals on four different soil types in Var and in the Lower Alps (France). It was found that the diseased plants on all the soils produced considerable less oil with a somewhat higher specific gravity and rotatory capacity than the healthy ones; the essence from the former was further found to contain a very low proportion of terpenic alcohols, the place of which was taken by abnormally large quantities of cineol.

CANONACO (A.). **Una batteriosi del Fieno Greco 'Trigonella foenum graecum' L.** [A bacteriosis of Fenugreek '*Trigonella foenum-graecum*' L.]—*Riv. Pat. veg.*, xxv, 9–10, pp. 373–377, 1935.

In February, 1935, the author examined wilted *Trigonella foenum-graecum* plants from a field where all the plants had been destroyed by the disease. The roots were healthy, but the stems bore yellowish to olivaceous lesions varying in length from only 2 to 3 mm. up to the whole length of one side. The affected epidermis was readily detachable and the cells, which were almost completely broken down, contained numerous bacteria; in some cases the bacteria were present in cavities in the underlying tissue. They were motile, rod-shaped, Gram-negative, aerobic, non-sporulating, isolated or arranged in chains of two or three, generally had one polar flagellum, and measured 1·5 to 2·5 by 0·8 to 1 μ. The creamy-white colonies grew slowly and had a wavy margin. The organism was slightly fluorescent, did not reduce nitrates, coagulated milk, produced ammonia but not indol, and grew best at 26° to 28° C. From these characters, the appearance of the lesions, and the nature of the host the author identifies it as *Bacterium medicaginis* [*R.A.M.*, xiv, p. 140]. Inoculations of healthy young wounded and unwounded *T. foenum-graecum* plants by watering with the culture liquid gave negative results, and it is considered that the original infections had been favoured by predisposing factors.

D'EMMEREZ DE CHARMOY (D.). **La lutte contre la mosaïque de la Canne à sucre à l'Île de la Réunion.** [Control of Sugar-Cane mosaic in the island of Réunion.]—*Rev. agric. Maurice, 1935*, 83, pp. 158–163, 1935.

As a result of replanting the most severely affected areas with the P.O.J. 2878 and Co. 213, 214, 281, and 290 sugar-cane varieties, mosaic is reported to be declining in Réunion [cf. *R.A.M.*, xiii, p. 59].

FAWCETT (G. L.). **Clava para la determinación de las variedades de Caña de Azúcar cultivadas en Tucumán.** [A key for the determination of the Sugar-Cane varieties cultivated in Tucumán.]—*Circ. Estác. exp. agríc. Tucumán* 44, pp. 81–94, 2 figs., 1935.

Among the characters included in this key (replacing *Circ.* 36 in the same series) for the determination of the sugar-cane varieties cultivated in Tucumán is their reaction to mosaic [*R.A.M.*, xii, p. 786]. Purple varieties immune from the disease include Tejp 24, and ten indigenous types, while among those contracting infection are B. 1376, Cheribon, Co. 281, D. 1135, P.O.J. 33, 213, 501, 826, 1228, 1547, and 2379, and five local sorts. Seventeen local varieties with green shoots, as well as Agaul, Kavangire, Oshima, P.O.J. 2725 and 2878, Yon Tan San, and Zwinga are immune from mosaic, which is found, however, on the following green varieties: India, ten P.O.J. selections, P.W.D. 38, 369 B, and one indigenous type. Of the mixed purple and green varieties, Kassoer, P.O.J. 2714 and 2883, and six local sorts are free from mosaic, while the disease affects F. 19 and P.O.J. 36, 161, 228, and 1419. Partial infection is contracted by Co. 213 (yellow), Co. 223, 272, and 284 (purple), Co. 270 (green), Co. 290 (grey), and a local purple type.

ADAMS (J.). **Some fungi from Anticosti Island and Gaspé Peninsula.**—*Canad. Field Nat.*, xlix, 6, pp. 107–108, 1935.

Among the fungi collected during visits to Anticosti Island and the Gaspé Peninsula, Canada, in 1933 and 1934 were *Plowrightia morbosa* [*Dibotryon morbosum*] on *Prunus* sp. [*R.A.M.*, xiv, p. 772], *Rhytisma salicinum* on *Salix candida* [ibid., xi, p. 157], *Chrysomyxa ledicola* on *Picea canadensis* [ibid., xii, p. 799], *Cronartium ribicola* on *Ribes* sp., *Melampsorella elatina* forming witches' brooms on *Abies balsamea* [ibid., vi, p. 450], and *Pucciniastrum americanum* on *Rubus strigosus* [ibid., xii, p. 104].

KERN (F. D.) & TORO (R. A.). **Notes on some fungi from Colombia.**—*Mycologia*, xxvii, 6, pp. 615–617, 1935.

This is a briefly annotated list of nine species of fungi, mostly rusts, which were collected by the authors in 1934 in Colombia, including *Cerotelium desmium* [*R.A.M.*, xi, p. 475] on cotton (*Gossypium peruvianum*).

CUMMINS (G. B.). **Notes on some species of the Uredinales.**—*Mycologia*, xxvii, 6, pp. 605–614, 1 pl., 4 figs., 1935.

The examination by the author of two herbarium specimens of a rust on yam (*Dioscorea alata*) from the Philippine Islands and Samoa, showed that the uredospores of both agree well with Raciborski's description, in 1910, of *Uredo dioscoreae-alatae*. The fungus was first described in 1875 by Berkeley and Broome as *Aecidium dioscoreae*, and was transferred in 1912 to the genus *Uredo* by Petch, who stated that it was apparently identical with *U. dioscoreae-alatae*; this transfer was not valid, since Henning had previously used the name for another species. The teleutospores of the fungus are embedded in a gelatinous matrix which, on the rupture of the epidermis, protrudes as a hyaline umbo; they are cylindrical, straight or more or less sinuous, smooth, hyaline, 8 to 10 by 40 to 60 μ, and becoming 4-celled, only the basidiospores being liberated above the surface of the matrix. These characters correspond closely to those of the genus *Goplana*, as described by Raciborski, and the rust is accordingly renamed *G. dioscoreae* (Berk. & Br.) comb. nov., with all the other names, except *U. dioscoreae* Henn., as synonyms.

Notes are also given in this paper on four other rusts, including one new species.

ROSTRUP (O.). **Bidrag til Danmarks svampeflora. II.** [A contribution to the fungus flora of Denmark. II.]—*Dansk bot. Ark.*, viii, 8, 60 pp., 13 figs., 1935. [English summary.]

This second annotated list (the first appeared in 1916) of Danish fungi collected by the late O. Rostrup is preceded by a biographical sketch of the well-known mycologist by C. Ferdinandsen and supplemented by an alphabetical index to both parts prepared by N. F. Buchwald. The present contribution comprises 827 species, of which 364 are new records for the country. Among the comparatively few fungi of phytopathological interest, *Gloeosporium umbrinellum* may be

mentioned as causing the partial defoliation of young oak trees, resulting in rather severe damage.

Săvulescu (T.) & Sandu-Ville (C.). **Beitrag zur Kenntnis der Micromyceten Rumäniens.** [A contribution to the knowledge of the Micromycetes of Rumania.]—*Hedwigia*, lxxv, 3, pp. 159–192; 4, pp. 193–233, 1935.

In this third contribution to the mycoflora of Rumania [cf. *R.A.M.*, x, p. 691], the writers enumerate a further 237 species of Micromycetes, bringing the total for the country to 579. Thirty species and varieties in the present list are new and accompanied by Latin diagnoses. Branches of apple were infected by *Dermatea corticola* Arn. (*Myxosporium corticola*) [*Neofabraea corticola*: ibid., x, p. 272], the conida of which measure 20 to 30 by 6·6 to 8·25 μ. *Diplocarpon soraueri* (Kleb.) Nannf. (*Fabraea maculata* [ibid., xiv, p. 772]), with conidia measuring 7 to 20 by 10 to 13 μ, was observed on quince leaves. The foliage of *Panicum miliaceum* was attacked by *Phyllosticta panici-miliacei* n.sp., with pycnidia 90 to 132 μ in diameter, and numerous rod-shaped, straight or curved spores, rounded at both ends, 4 to 5 by 2·2 μ. The symptoms of the maize leaf spot caused by *P. zeae* Stout [ibid., x, p. 305] agree with those reported from the United States; the elliptical or oval spores of the Rumanian material measure 4·4 to 6 by 2·3 to 3 μ (average 5 by 3 μ) compared with 4·5 to 7·5 by 2 to 3·5 μ for the American specimens.

Septoria tomates Speg., differing from *S. lycopersici* and its f. *italica* (stated to be the only European representatives of the genus hitherto known on the tomato) in its much shorter, more slender, sub-sigmoid spores, 36·3 to 59·4 by 1 μ in the writers' material, 30 to 50 by 1 μ in the original diagnosis, was found on tomato leaves. The fungus had previously been reported only from Brazil.

Heterosporium iridis-pumilae n.sp. forms scattered, circular to elliptical, yellowish-brown spots with a purplish-brown margin, becoming shrivelled, 1 to 5, mostly 2 to 4 mm. in diameter, on both sides of *Iris pumila* leaves. The simple, caespitose conidiophores measure 26 to 56 by 6 to 10 μ and the yellow-brown, verruculose, straight, biscuit-shaped, 2- to 3-septate conidia, 26 to 42 by 13 to 16 μ.

Red currant leaves were found to bear amphigenous, irregular, scattered or confluent lesions, 3 to 10, mostly 4 to 5 mm. in diameter, brown to olivaceous on the under, brown with greyish-white tufts on the upper side, with a dark purple or purplish-brown margin, caused by *Cercospora ribis-rubri* n.sp. The fungus is characterized by fasciculate, simple, continuous, erect conidiophores, light brown at the base, subhyaline and bi- to trinodular at the apex, 26·5 to 50 by 4 to 5, mostly 33 to 40 by 5 μ, and by vermicular, slightly curved or flexuous, 2- to 5-, usually 3- to 4-septate, subhyaline to pale brownish conidia, rounded or shortly stipitate at the base, tapering towards the apex, 60 to 115, mostly 66 to 82 μ long and 4 to 5 μ wide at the base (2·5 to 3 μ at the apex). Both in the nature of the lesions induced and in morphological characters the new species differs from *C. ribis* Earle, *C. ribicola* Ell. et Ev. (to which it approximates most closely), and *C. marginalis* Thüm., the other agents of currant leaf spots.

Macrosporium pruni-mahalebi n.sp., forming amphigenous, circular, brown, later yellow to pallid, shrivelled, dark-edged spots, 2 to 6 mm. in diameter, on *Prunus mahaleb* foliage, has simple conidiophores, 128 to 135 by 5 μ, on which are borne brown to fuliginous, oblong to ovoid conidia with a subhyaline pedicel [beak], 26 to 50 by 10 to 14, mostly 33 to 40 by 13·2 μ, with 4 to 10 transverse, and 1 to 2 vertical septa.

Alternaria capsici-annui n.sp. [ibid., xiv, p. 215] forming irregular, grey, greyish-brown, or greyish-black spots, 2 to 6 cm. in diameter, on chilli fruits in association with *Actinomyces todschlidowskii* [loc. cit.], is characterized by simple conidiophores, 40 to 50 by 5 μ, bearing catenulate [ob]clavate, elongated or fusoid, brown or yellowish-brown conidia, 32 to 82 by 7 to 21 μ, with 3 to 7 transverse and 1 to 3 longitudinal septa. The fungus was grown in pure culture on a number of media and inoculation experiments on both the thick and long types of chilli and on 'blau' tomatoes gave positive results (very slow on the latter host), whereas pungent chillies showed a high degree of resistance and green and red tomatoes were immune.

WALLACE (G. B.). **Armillaria root rot in East Africa.**—*E. Afr. agric. J.*, i, 3, pp. 182–192, 5 figs., 1935.

A full account is given in semi-popular terms of *Armillaria mellea* root rot [*R.A.M.*, xiv, p. 678 and above, p. 232], with special reference to East African conditions. After discussing the geographical distribution of the fungus and tabulating its host range in East Africa, the author describes the symptoms of the disease on tea, coffee, and other trees, and records the occurrence of sporophores of the fungus, found growing from dead forest roots in a tea plantation in Tanganyika in July, 1935. The fungus (for which the name *A. mellea* is retained for the present) differed slightly from *A. fuscipes* [ibid., x, p. 525] in having more sporophores (up to 27) in a group, smaller caps (diameter up to 5·5, but usually about 3·5 cm.), and longer stalks (up to 13·5, usually 5 to 8 cm. high); the white, smooth, oval spores measured 6·3 to 9·2 by 4·5 to 6·4 μ.

The dependence of *A. mellea* for part of its parasitic activity on environmental and other factors is discussed, and the paper terminates with notes on measures of control [ibid., xiv, p. 451]. In one coffee plantation in Tanganyika where isolated cases or groups of up to six occurred, control was effected by the removal of infected coffee trees together with contaminating roots, while on a tea estate, those areas where the stumps were all removed before planting have remained almost free from attack, whereas others in which they had to be left are heavily infected.

McKINNEY (H. H.). **The inhibiting influence of a virus on one of its mutants.**—*Science*, N.S., lxxxii, 2133, pp. 463–464, 1935.

Tobacco plants were inoculated with mixtures of the common (light green) and yellow mosaics in which the extract of the latter was 999 times more concentrated than that of the former [*R.A.M.*, ix, p. 260]. All the plants developed yellow mosaic, but 47 days after inoculation the young leaves were showing common mosaic symptoms. In other

plants simultaneously inoculated with mixtures containing 499 and 99 parts, respectively, of yellow mosaic extract, yellow mosaic symptoms also developed but were followed by those of ordinary mosaic more rapidly than in the foregoing series.

Tobacco plants with yellow mosaic were reinoculated with a highly purified virus of common mosaic [ibid., xv, p. 177]. In from 5 to 20 leaves subsequently produced yellow mosaic symptoms were apparent, in the next 8 to 25 they were largely replaced by those of common mosaic, while the latter alone were observed in the foliage developing later. The yellow mosaic virus was present only in small amounts, chiefly in the first few leaves.

Regarded from the standpoint of 'acquired' or 'induced' immunity [ibid., xiv, pp. 388, 600, 812], the common mosaic virus may be interpreted as an immunizing agent or 'vaccine', and from the evidence here adduced a state of incompatibility exists between it and the yellow mosaic virus, involving the ultimate suppression of the latter by the 'vaccine' virus in the meristematic tissues. In so far as the disease induced by the common mosaic vaccine assumes a permanent and severe form, this immunizing agent must be ranked in a low or primitive category. On the other hand, however, it is entitled to high rank as inhibiting and to a large extent curing the disease caused by the yellow mosaic. The *G* virus used in Salaman's tests against the *L* virus in tobacco and *Datura stramonium* [ibid., xii, p. 581] is an even more efficient vaccine, inducing very slight symptoms with no appreciable effect on the health of the plants.

The inhibitory action of the common mosaic virus is regarded as convincing evidence that the occasional small yellow mosaic spots consistently associated with common mosaic in upwards of 5,000 tobacco plants examined by the writer arose as mutants in the diseased tissues and not from an external source. The scarcity of plants with pure yellow mosaic in commercial tobacco and tomato fields is now explicable as due to the restriction of this virus by that of common mosaic, the proportion of the latter entering and becoming established in the plants far exceeding that of the former.

JOHNSON (F. H.). **Cultural studies on the virus of Tobacco mosaic.**— *Phytopathology*, xxv, 11, pp. 1035–1037, 1935.

Details are given of the writer's experiments to culture the tobacco mosaic virus [see preceding abstract] *in vitro*. A given amount of sap (usually 9·9 c.c.) from the ground or unground leaves of healthy tobacco plants was inoculated with a specified quantity (generally 0·1 c.c.) of sap from mosaic plants rendered bacteria-free by passage through a Berkefeld 'W' filter [cf. *R.A.M.*, xiv, p. 722] and incubated for a week at 30° C. The infectivity of the culture was then tested by inoculating tobacco plants and at the same time a subplant was made into another tube of the same medium, the process being continued and infectivity tested at each stage through dilutions of 1:1,000,000. The original inoculum was never found to be infectious at a dilution exceeding 1:100. Attempts to obtain an enhanced degree of virulence by variations in the method of procedure gave negative results, except in one instance, which was not experimentally repeated.

Johnson (E. M.) & Valleau (W. D.). **Cultural variations of Thielaviopsis basicola.**—*Phytopathology*, xxv, 11, pp. 1011–1018, 2 figs., 1935.

Observations are made on the differences observed between eleven cultures of *Thielaviopsis basicola* isolated from White Burley tobacco [*R.A.M.*, xv, p. 61] in Kentucky and grown on potato dextrose agar. Two of the cultures from one locality were dark olive, with a deep greyish-olive, powdery mycelium, forming concentric rings, while the others were of various shades of olive and brown. Some produced almost exclusively endoconidia, others predominantly (and one only) chlamydospores. The variants are believed to have originated during the first fortnight of growth in test tubes, becoming more conspicuous on the transference of the cultures to Petri dishes. Single endoconidium cultures from the foregoing differed among themselves and were also unstable in culture, while monospore cultures of monospore cultures were as unstable as the original isolants and the monospore cultures whence they came. An albino culture, forming both endoconidia and chlamydospores, developed as a sector in one dish; no colour was produced after four years' subculturing. Seven monospore cultures of the albino were also white and formed both types of spores. In pathogenicity tests on White Burley tobacco the albino culture appeared to be slightly more virulent than the remainder, between which little difference in this respect was observed. Reproductive bodies failed to develop at 27° C. either in old cultures or in dishes containing two or more intermingling monospore cultures from different sources.

Mes (Margaretha G.). **Some observations on leafspots of Tobacco caused by phosphorus deficiency.**—*S. Afr. J. Sci.*, xxxii, pp. 246–256, 1935.

Further studies on Maryland and Brazilian tobacco plants grown in water cultures deficient in phosphorus and supplied with increasing concentrations of iron tartrate [*R.A.M.*, ix, p. 414] showed that on light green leaves the spots formed are white and closely resemble those of 'pock disease' in the Dutch East Indies [ibid., xi, p. 333.] On the darker foliage the reddish-brown spots are reminiscent of a disorder of obscure origin known as 'red rust' in South Africa [ibid., x, p. 585]. Between these two extremes various transitional forms may be observed.

Symptoms of boron deficiency, including dying-off at the tips and growing points, blackening of the axillary buds, shedding of the flowers and fruit, and downward curling of the leaves, were cured by the addition of this element to the cultures [cf. ibid., xiii, p. 659].

Smith (K. M.). **A new virus disease of the Tomato.**—*Ann. appl. Biol.*, xxii, 4, pp. 731–741, 3 pl., 1935.

This is an account of the author's studies of the tomato virus disease recently described by him as new [*R.A.M.*, xiv, p. 724; xv, p. 180], the results of which showed that it is readily sap-transmissible, one of its characteristics being its extremely short incubation period in certain host plants. At a mean daily temperature of 60° to 70° F., in tobacco

(White Burley) and *Nicotiana langsdorffii* leaves it causes local lesions three days after inoculation, in the form of small, red spots surrounded by a yellowish halo, which rapidly dry out; infection does not become systemic in the proper sense of the word, but about one-tenth of the inoculated tobacco plants may develop a few scattered lesions on uninoculated leaves. On *N. glutinosa* small, round local lesions are formed on the inoculated leaves in about 48 hours, which gradually increase considerably in size (sometimes up to 5 mm. in diameter), but usually no further development of the disease takes place. *Datura stramonium* and cowpea (*Vigna sinensis*) are valuable differential hosts for this virus; on the former it causes circular or dendritic yellow spots on the inoculated leaves in about five days, and systemic infection develops normally; the disease is very severe, and is characterized by a very bold, yellow and green variegation and a severe blistering and deformation of the leaves, with occasionally a stem lesion. On the cowpea small lesions, with deep red edges and pale centres, develop in three to four days; they are at first pale, but rapidly turn red and increase in size; systemic spread of the virus in this host has not been observed. Local infections have also been obtained on a few other unrelated plants.

The virus loses its viability fairly rapidly in extracted sap at room temperature but showed no apparent reduction in concentration after storage for 28 days at 1° C.; it withstood 10 minutes' immersion in hot water at 78° but was inactivated at 80°, and in one instance it tolerated 95 per cent. alcohol for 24 hours; it appeared to be unable to withstand desiccation, and infection was rarely obtained at dilutions greater than 1 in 10,000 with crude expressed sap. Filtration through gradocol membranes showed that the approximate particle size of the virus is 25 to 27 $\mu\mu$. The disease was not reproduced in tomato seedlings raised from the seed from mottled tomato fruits, indicating that seed transmission, if it occurs, is not frequent. It was also shown that previous infection of plants with tobacco virus 1, tobacco ring spot, and tomato spotted wilt did not confer immunity from infection with the new virus, indicating by analogy that the latter is entirely distinct from the other viruses.

AINSWORTH (G. C.). **Another new virus disease of Tomato.**—*Gdnrs' Chron.*, xcviii, 2549, p. 320, 2 figs. (1 on p. 321), 1935.

Three further cases of the new virus disease of tomatoes recently described by K. M. Smith, characterized by severe stunting of the plant and yellow spotting and discoloration of the leaves [see preceding abstract], were received at the Cheshunt Experimental Station during March and April, 1935, and another instance was recorded from Northern Ireland in May.

In the present note the symptoms of yet another apparently new virus disease of the same host are described. The plants, which originated in a commercial nursery at Waltham Abbey, Herts., bore on the underside of the leaflets interveinal leafy outgrowths or enations ranging in size from inconspicuous ridges or shallow frills to well-developed, leaf-like structures ¼ in. across [cf. *R.A.M.*, xv, p. 181]. The affected leaflets are usually somewhat narrowed and misshapen like those suffering from 'fern leaf', a condition further recalled by the

filiform appearance of the leaves without enations. In addition to the distortions the foliage, especially near the top of the plant, shows a mottling similar to that of tomato mosaic.

The disease was found to be readily transmissible to healthy plants by mechanical inoculation with the juice from infected ones, and enations developed on all the test plants after two to three weeks. The virus was ascertained to be a strain of the ordinary tomato mosaic, with which it agrees in its rapid spread from plant to plant during pruning operations and further in its capacity for survival in dead plant material. Smoking tobacco is liable to infection by this strain of tomato mosaic, which may thus be introduced into a crop by a workman handling the plants with fingers contaminated from a cigarette.

WAGER (V. A.). **Brown rot of Tomato fruits due to Phytophthora parasitica Dast.**—*S. Afr. J. Sci.*, xxxii, pp. 235–237, 1935.

Tomatoes in the eastern Transvaal were destructively attacked in 1934 by a disease locally known as brown rot, the first symptom of which is a small, brown spot, rapidly enlarging in the form of concentric, olive-brown rings and spreading through the interior of the fruit, causing a soft, malodorous rot. The decay has subsequently been observed on tomatoes on the Highveld.

The fungus isolated from the rotted material was characterized by oogonia measuring 21 to 30 μ (average 27·3 μ), oospores 18 to 27 μ (21·6 μ), amphigynous antheridia 12 μ, chlamydospores 16·2 to 32·4 μ (27 μ), papillate sporangia 31·9 to 54·6 by 27·3 to 37·8 μ (average 43·7 by 32·8 μ), and spores 11 to 13 by 6 to 9 μ. It was identified by S. F. Ashby as *Phytophthora parasitica* [*R.A.M.*, xiv, p. 263]. Inoculation experiments on wounded green tomatoes with fragments of oatmeal agar cultures of the fungus gave positive results at 25° C. The disease occurs only during the summer months and is favoured by rainy weather. It is more prevalent on fruit exposed to the sun, e.g., through partial defoliation by *Macrosporium* [*Alternaria*] *solani* than on that well provided with dense foliage. *P. parasitica* has also been observed in South Africa on rhubarb [ibid., xi, p. 331] and two succulents, *Cotyledon* sp. and *Trichocaulon* sp.

Suggested control measures are the immersion of the fruit for 1½ minutes in water heated to 60°, spraying with a copper-containing mixture and a good spreader, and staking the plants to avoid infection from zoospores splashed up from the soil.

NIGHTINGALE (ALICE A.) & RAMSEY (G. B.). **Development of Phoma rot of Tomatoes in transit and storage.**—*Circ. U.S. Dept. Agric.*, 371, 8 pp., 1935.

Phoma destructiva [*R.A.M.*, xiv, p. 475] is one of the most important causes of loss of tomatoes in transit and storage in the United States, where, though reported from all the tomato-growing areas, it is most serious in consignments from Florida. In 1934, 16 test crates of disease-free 'mature green' tomatoes wrapped and packed in the usual manner and dispatched from Florida on arrival at Chicago 7 days later showed 33·8 per cent. infected fruits, an average of 2·5 spots per fruit. The lesions ranged from 0·1 to 1·75 cm. in diameter, and about 38 per cent.

had little commercial significance as they were under 0·5 cm. in diameter and the fruits were still marketable; 47 per cent. originated at the stem scar, 41 per cent. in shoulder bruises, and the remainder in other wounds or injuries. Of the lesions 1 cm. or more in diameter 76 per cent. occurred on ripe fruits and the remainder on fruits turning red. Only two lesions over 0·6 cm. in diameter were found on green tomatoes.

The rot developed more rapidly on ripe than on green tomatoes, and at the higher temperature during April and May than in January. Nearly all the spots that developed in storage were already visible after 6 or 7 days' transit, though many of those present at the stem scars would not have been noticed in packing. Fruits apparently unaffected on arrival after 4 or 5 days' transit often bore imperceptible infections which later developed into visible lesions. Pycnidia were formed in the larger lesions on ripe tomatoes but not on green ones, and a few new lesions developed about stem scars or in injured areas as a result of the spread of pycnospores on fruits kept 7 to 20 days in storage. Under ordinary ripening-room conditions there would be little spread of infection from one tomato to another.

HIROE (I.). **Brachysporiose of plants. IV.**—*Ann. phytopath. Soc. Japan*, v, 2, pp. 121–144, 5 figs., 1935. [Japanese, with English summary.]

The twenty-four strains of *Brachysporium* pathogenic to plants in Japan are stated to be divisible on a morphological, physiological, and pathological basis into six groups, of which I includes seven identical strains occurring, respectively, on rice, pepper (*Capsicum annuum*), a variety of *Echinochloa* [*Panicum*] *crus-galli*, a variety of *Coix lacryma-jobi*, *Cynodon dactylon*, *Alopecurus agrestis* [*A. creticus*], and *Cyperus iria*, and collectively referred to *B.* (*Helminthosporium*) *tomato* [with a revised diagnosis: *R.A.M.*, xiv, p. 344]. The fungus, which occurs on tomato (in the United States), pepper, *Coix*, and rice [see also ibid., xiii, p. 653] fruits, and on the living leaves of rice and other hosts (as well as wheat in inoculation tests) in Japan, produces oblong, subspherical, circular, or irregular, often confluent, chestnut-brown, later fuscous to black lesions, and is characterized by simple, erect, slightly flexuous, 5- to 10-septate conidiophores, 50 to 400 by 4 to 9 μ, with subbulbous, light brown bases, and by solitary, oblong, erect or slightly curved, 1- to 4-, generally tri-septate, yellowish-brown conidia, the outermost cells paler, measuring 10 to 45·6 by 5·6 to 16·8 μ (mostly 18 to 30 by 10 to 12 μ).

All the strains isolated made vigorous growth on apricot decoction agar and synthetic media with peptone and asparagin, forming dark grey, cottony colonies and numerous dark sclerotia; conidial production is most profuse on apricot decoction agar. The optimum temperature for the growth of all strains on Saito's onion soy agar is 32° C., with a maximum at 40°.

VERRALL (A. F.) & GRAHAM (T. W.). **The transmission of Ceratostomella ulmi through root grafts.**—*Phytopathology*, xxv, 11, pp. 1039–1040, 1 fig., 1935.

In the course of investigations on the Dutch elm disease (*Ceratostomella ulmi*) in the United States [*R.A.M.*, xv, p. 184], the occurrence

of root grafts, involving complete vascular union between the trees, was found to be common. In 1935 twelve diseased trees were found grafted to the roots of stumps known to have been diseased and removed in the 1934 control operations. The discoloration, from which the fungus was isolated, was traced in each case from the stump, through the grafted roots, and into the stem of the adjacent tree. In five of the trees the symptoms were present in the grafted roots, collar, and lower stem but absent from the crown—the ordinary means of entry.

SCHIMMLER (G.). **Rauchschäden an Laub- und Nadelgehölzen.** [Smoke injuries to broad-leaved trees and conifers.]—*Gartenflora*, lxxxiv, 9, pp. 271–272, 1935.

In the industrial centres of Germany, such as the Saar and Ruhr Valleys, Aachen [Aix-la-Chapelle], Saxony, and Upper Silesia, heavy damage is inflicted on hard- and softwoods, shrubs, and the like by the poisonous gases (e.g., sulphur, hydrochloric acid, and fluorine compounds) emanating from factories [*R.A.M.*, xiv, p. 725]. Conifers, especially *Picea excelsa*, have been found particularly susceptible to this form of injury; *Abies nordmanniana*, *P. pungens* and its var. *glauca kosteri* [var. *kosteriana*], *P. engelmanni*, and *P. omorika* are more resistant. Among hardwoods the ash suffers more severely than beeches, oaks, and poplars, while a high degree of resistance is shown by evergreens, such as *Ilex*, *Buxus*, and *Rhododendron*, with their leathery foliage.

The diagnosis of smoke injury presents great difficulties, external symptoms being somewhat deceptive and requiring confirmation by microscopic examination and chemical analysis. The following, however, are indications of gas poisoning: white, yellow, brown, or black discolorations of variable extent of the intercostal areas of hardwood leaves, premature defoliation, desiccation of the crown and branch tips, absence of algae and lichens, a sooty deposit, and (in beeches) a greyish tint on the bark. In conifers the older needles either turn reddish-brown or are shed, their incapacity for complete closure of the stomata exposing them to the full toxicity of the fumes. In consequence of defective assimilation the annual growth increment, measured by the width of the rings, is reduced.

Certain measures may be adopted to minimize the noxious effects of factory gases. Thus, one or more parallel rows of resistant trees may be planted transversely to the direction of the fumes, a method in operation in the 'green belt' surrounding Cologne, where extensive sheets of water also absorb the toxins. The care and nourishment of the trees are also very important. Precautions to prevent the escape of the gases should also be taken by those in charge of the factories. High chimneys merely aggravate the trouble, the fumes often being carried for distances of 6 to 8 km.

JONES (S. G.). **The structure of Lophodermium pinastri (Schrad.) Chev.**—*Ann. Bot., Lond.*, xlix, 196, pp. 699–728, 20 figs., 1935.

A detailed account is given of the author's field and laboratory studies of the infection of pines (*Pinus sylvestris*) in several localities in Wales with *Lophodermium pinastri* [*R.A.M.*, xiv, p. 663], with particular

reference to the cytological details of the process. It is stated that a copious emission of ascospores of the fungus can usually be obtained in early May from fallen pine needles, and that the first visible signs of infection on the living needles are seen usually towards the end of June as small, greyish areas; the colour, however, varies considerably, being sometimes yellow or tinged with purple. The continuous, filiform ascospores, supplied with gelatinous sheaths, and 90 to 140 by 1·5 to 1·7 μ in size, germinate usually from or near the blunt end of the spore, by the production of a short germ-tube, which soon expands into a large, multinucleate vesicle; on artificial media growth is soon arrested, and all attempts to induce the fungus to fructify in culture gave negative results.

Infection of the leaves occurs through the stomata, one or more invading hyphae sending into the guard cells a fine branch which soon forms a small plexus within. In the substomatal space the hyphae become considerably dilated, almost vesicular; the vesicle immediately produces a number of branches which frequently coil around it, the whole body eventually becoming covered with deposits of a black substance. After this the fungus forms rather coarse, yellow hyphae which soon branch into a finer and hyaline type; this mycelium rapidly disintegrates the mesophyll, and eventually reaches the stele, usually through the middle lamellae in the radial cell walls of the endodermis. Once within the stele, the mycelium takes the shortest route to the phloem through the cell walls. The fungus penetrates very few xylem tracheids and was never found in the pitted cells of the transfusion tissue, this fact with the crippling of the guard cells probably accounting for Tubeuf's and Langner's [ibid., xii, p. 604] statements that the transpiration current is more active from diseased than from healthy leaves. The well-known black rings, entirely encircling the leaves, consist of a few layers of dead mesophyll tissue, in which the cell walls are somewhat thickened and heavily impregnated with black pigment. In addition to the shedding of the needles caused by the premature formation of cork layers at the base of the dwarf shoots, defoliation can also be brought about from the deposition of the black substance in the region that would normally form the cork barrier, in which case the fungus is able to reach the stem.

The minute, black, oval pycnidia (which the author considers to be spermogonia) generally appear towards the end of the summer, but the time varies according to the relative humidity [ibid., v, p. 455]. They are laid down at any point within the leaf between the epidermis and hypodermis; as they increase in size a large number of elongated and erect spermatiophores is formed from the hypothecium, from which enormous numbers of bacilliform spermatia, 4 to 8 by 0·5 μ, are abstricted. In some, not all, spermogonia, besides the spermatiophores, a relatively few specialized hyphae are also formed, and are interpreted by the author as perhaps constituting the oogonial and trichogynous parts of a sexual apparatus, though fertilization has not been detected so far. Such spermogonia may eventually become converted into apothecia, while the others dry out. Most of the apothecia, however, are formed independently of the spermogonia, and are considered to develop from the intermingling of mycelia, possibly of opposite sexual

strains; they are distinguished from the former by the character of the roof covering, which is described in detail, as well as the development of ascogenous hyphae and the formation and germination of the spores.

Markwardt (L. J.) & Wilson (T. R. C.). **Strength and related properties of wood grown in the United States.**—*Tech. Bull. U.S. Dep. Agric.* 479, 99 pp., 3 figs., 22 diags., 14 graphs, 1935.

This highly technical bulletin, supplemented by 21 tables setting forth the statistical data obtained in the course of extensive studies at the Forest Products Laboratory, Madison, Wisconsin, contains some observations on the preservative treatment of wood in relation to its strength and allied properties.

Coal-tar creosote, water-gas tar, wood-tar creosote, creosote-tar, and creosote-petroleum mixtures have been found to be practically inert to wood, on which they exercise no adverse chemical influence, and the same may be said of the 2 to 5 per cent. zinc chloride solutions in common use. However, even with substances harmless in themselves, faulty methods of treatment may seriously impair the strength of the timber, e.g., where green wood is conditioned for injection by steaming or boiling under vacuum at extremely high temperatures or for unduly prolonged periods. A temperature of 259° F. (pressure 20 lb.) should not be exceeded in steam conditioning; the maximum reached in the boiling-under-vacuum process is usually below 210°. Severe end checking and collapse are liable to result from the use of pressures above 175 lb. in the injection of preservatives into woods (especially those of low density) softened by lengthy heating.

Some general information on the conditions predisposing to decay and the means of obviating infection by wood-destroying fungi is also presented [see next abstracts].

Wood handbook. Basic information on wood as a material of construction with data for its use in design and specification.—U.S. Dep. Agric., Washington, D.C., 325 pp., 6 pl., 3 figs., 54 diags., 4 graphs, 3 maps, 1935.

This manual on the technical applications of wood as a building material, prepared by R. F. Luxford, G. W. Trayer, and collaborators, is stated in the foreword to be based chiefly on the accumulated information accruing from engineering and allied investigations conducted at the Forest Products Laboratory, Madison, Wisconsin, during the last twenty years. The sections on protection against wood-destroying organisms (fungi on pp. 249–253) and wood preservation (pp. 263–282) by C. Audrey Richards and G. M. Hunt, respectively, contain useful information in a condensed form on the etiology of decay in timber and its control by up-to-date methods of treatment [see preceding and next abstracts.]

MacLean (J. D.). **Manual on preservative treatment of wood by pressure.**—*Misc. Publ. U.S. Dep. Agric.* 224, 123 pp., 3 figs., 3 diags., 29 graphs, 1935.

The purpose of this valuable manual is stated in an introductory note to be a discussion of the application of the results obtained in extensive

theoretical and practical researches at the Forest Products Laboratory, Wisconsin, on the technical problems surrounding the pressure treatment of wood to the improvement of this process, besides presenting a summary of the available information on the subject [cf. preceding abstracts]. The work is divided into the following sections: wood preservatives, effect of wood structure on treatment, moisture content, specific gravity, and air space in wood, preparation of timber for treatment, injecting preservatives, absorption and penetration, effect of treatment on the physical condition of the wood, 'bleeding' of treated wood [*R.A.M.*, xiv, p. 205], treating conditions used in commercial practice, specifications for treatment, and formulae for computing (*a*) relation of moisture content, specific gravity, and air space in wood, and (*b*) temperatures in timbers under given conditions.

Demere (C.). **Preservatives and antitermite protection of timber.**—*Industr. Engng Chem.*, xxvii, 11, pp. 1303–1305, 1 fig., 1935.

Three types of wood preservatives, known as the Bruce Preservatives 5–A, 5–B, and 5–C, have been developed by the E. L. Bruce Company, Memphis, Tennessee, to meet the various needs of the building industry. Among the fourteen requirements to which these preparations are stated to conform are a high degree of toxicity to wood-destroying fungi and insects, resistance to leaching, non-volatility, absence of properties causing discoloration or other injury to the wood and corrosion of metal, non-inflammability, non-toxicity to human beings, and availability to the trade at a competitive economic level.

Preservative 5–A consists of β-naphthol [*R.A.M.*, xiii, p. 790] in solution in a combination of two grades of black fuel oil and imparts a dark brown colour to the wood, thus disposing of the need for painting outside surfaces. A colourless, rapidly evaporating petroleum distillate is used as a carrier in 5–B (a preparation patented by the Fire Underwriter's Laboratories), which may be glued and painted and is generally well adapted for domestic use. Preservative 5–C resembles 5–B but contains a certain amount of asphalt which acts as a colouring agent and moisture-resistant sealer. It has been widely used during the last four years in the construction of motor-car bodies.

The timber is heated to 190° F. under controlled humidity conditions, thereby expelling 90 to 95 galls. of air from 1,000 bd. ft. of wood, and immersed in the preservative long enough for the absorption of some 35 galls. per 1,000 ft., involving the cooling of the timber to about 120° F. in the tank. This amount of preservative contains some twenty times as much of the toxic principle as is necessary to repel fungal and insect attacks, and in common practice the admission of 20 to 30 galls. suffices. On the removal of the wood from the tank, penetration continues for a time owing to further contraction of the air within; during this process the timber dries rapidly and is very shortly ready for use.

Schmid (W.). **Ueber Verpilzung von Feuchtholzschliff.** [On the fungal infection of groundwood pulp.]—*Papierfabrikant*, xxxiii, 46, pp. 380–382; 47, pp. 387–389, 1935.

The writer reviews some recent outstanding contributions, chiefly from the Scandinavian literature, to the prevention of blue moulds

(*Cadophora fastigiata*, *Lecythophora lignicola*, *Pullularia pullulans*, *Trichosporium heteromorphum* [and *Ceratostomella* or *Ophiostoma* spp.]) in groundwood pulp in the open and closed grinding systems [*R.A.M.*, xiv, p. 545].

Rennerfelt (*Svensk Trävaru Tidn.*, li, p. 680, 1935) has drawn attention to the increased susceptibility to infection of frozen wood on thawing, a fact that accounts for the extensive damage from blue mould in the far north, where autumn- and winter-felled timber frequently lies in the open for months awaiting transport.

The possibilities of chemical control of fungus infection of pulp are limited by economic considerations. In Swedish mills the maximum outlay authorized for this object is 25 öre [3¼d.] per ton. Chloramine has given conflicting results, but a satisfactory report on its cheapness and efficacy in a Finnish paper factory has been given by Monnberg (*Papp. Trävarutidskr.* Finl., xv, p. 900, 1933). The following method has been patented in Norway. A mixture of 90 to 95 per cent. (by weight) of chlornaphthalene and 5 to 10 per cent. mercury acetate is heated until the bulk of the acetic acid has evaporated, and the resultant transparent liquid is sprayed, in the form either of an emulsion or solution, over the pulp or cellulose at the rate of 10 to 100 gm. per ton. Attempts are stated to be in progress in Sweden to cultivate on a large scale, for incorporation in the grinding water, certain yeast-like organisms exerting an antagonistic effect on the agents of blueing.

BUGNICOURT (F.). **Contribution à l'étude du Sphaerostilbe repens B. et Br.** [A contribution to the study of *Sphaerostilbe repens* B. & Br.]—*Bull. écon. Indochine*, xxxviii, pp. 471–477, 2 pl., 1935.

Continuing his investigations on the parasitism of *Sphaerostilbe repens* on *Aleurites montana* in Indo-China [a preliminary note on which has already appeared: *R.A.M.*, xiv, p. 480], the writer has detected the fungus on the root system and collar, the latter, together with the base of the trunk, showing fissures and a depression of the cortex consequent on the destruction and desiccation of the underlying tissues. Death supervenes when the necrosis encircles the trunk, disintegrating the cambium and disorganizing the conducting system in such a way as to interrupt the necessary communication between the roots and aerial parts; a few days earlier the leaves may wither and fall, sometimes only on one side of the tree. An examination of the tap- and other roots showed that the cortex was readily detachable and the tissues watery and intersected by black or bluish lines. Branched rhizomorphs were found to be spreading below the cortex and conidia were observed on some of the roots. The desiccated areas of the trunk bore a profusion of *Diplodia* [*Botryodiplodia*] *theobromae* fructifications and the pustules of an undetermined *Fusarium*.

Infection by *S. repens* occurs in well-marked patches and was found to be in no way favoured by the local soil conditions, which are physically and chemically adapted to the cultivation of *Aleurites*. The fungus must be regarded, therefore, as a virulent pathogen, the control of which is likely to present considerable difficulties. Among the measures tentatively proposed for its suppression are the surrounding of the infection foci by trenches 1 m. deep by 0·60 m. wide, the complete

eradication and burning *in situ* of diseased trees, and soil disinfection with lime (1 part to 4 of soil), which quickly raises the temperature sufficiently to kill the fungus, or 1 per cent. commercial formalin, 15 l. per sq. m.

PERSONS (T. D.). **Anthracnose disease of Eggplants.**—Abs. in *Phytopathology*, xxv, 10, p. 967, 1935.

Two fungi were isolated from two distinct types of lesions on eggplant fruits in Mississippi in 1934, one closely resembling *Gloeosporium melongenae* [*R.A.M.*, vii, p. 21] and the other regarded as identical with *Colletotrichum truncatum* [ibid., xiv, p. 416], apparently not hitherto recorded on eggplant. The latter fungus produced on Lima beans [*Phaseolus lunatus*] lesions similar to those caused by the bean fungus.

Destructive Insect and Pest Acts, England. The Fruit Tree Pests (Middlesex) Order of 1935. Dated November 1, 1935.—4 pp., 1935.

As from 1st December, 1935, the Local Authority for the Administrative County of Middlesex is authorized to order the inspection and, if necessary, the treatment of any apple and pear trees in the Petty Sessional Divisions of Spelthorne and Uxbridge for scab [*Venturia inaequalis* and *V. pirina*: *R.A.M.*, xiv, p. 672], brown rots [*Sclerotinia laxa* and *S. fructigena*], and cankers [*Nectria galligena*].

MARCHIONATTO (J. B.). **Argentine Republic: the 'Dirección de Sanidad Vegetal' of the Ministry of Agriculture. Organization and functions.**—*Int. Bull. Pl. Prot.*, ix, 11, pp. 245–248, 1 diag., 1935.

By a Ministerial Resolution, dated 21st January, 1935, the Department of Plant Health (of the Argentine Republic) was separated from the Department of Agricultural Protection and Plant Health and its scope and functions were further defined by a similar Resolution of 8th February, 1935. Included in the investigation services are the Divisions of Phytopathology, Agricultural Zoology, and Analysis and Commercial Classification of Seeds. The inspection services comprise the Divisions of Sanitary Inspection of Plants and the Sanitary Offices for Plant Imports and Exports. There are also an official factory for insecticides and fungicides and a plant quarantine station. The object of the investigation services is to study plant diseases and parasites with a view to their eradication by appropriate treatments, as well as to give practical advice to farmers. The inspection services, besides regulating the entry of plant products into the Republic, are entrusted with the permanent supervision of commerce in orchard, forest, and ornamental plants throughout the country. Phenological data are collected and applied to the practical control of pests and diseases by the Verification and Sanitary Control Services, while the accessory work of the Department includes (*a*) the determination of conditions for the use of insecticides and fungicides (in co-operation with the Insecticide and Fungicide Commission appointed by Decree of 9th November, 1934); (*b*) advisory activities in connexion with the application of the laws and regulations governing the sanitary condition of plants; and (*c*) the collection and registration of phytosanitary legislative measures at home and abroad.

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

Vol. XV MAY 1936

Foëx (E.) & Burgevin (H.). **Nouvelles observations sur l'action du bore dans la maladie du coeur de la Betterave.** [New observations on the action of boron on heart rot of Beet.]—*C. R. Acad. Agric. Fr.*, xxi, 25, pp. 979–982, 1935.

Continuing their experiments in the control of heart rot of beet in France [*R.A.M.*, xiv, p. 282], the writers again proved the value of boric acid [ibid., xv, p. 189] and sodium borate for this purpose, the former applied at 8 to 10 and the latter at 13 to 16 kg. per hect. for the first treatment and subsequently reduced to an amount to be accurately determined by further trials. [This paper was followed by a discussion (pp. 982–985) by [A.] Demolon and G. Bertrand.]

Brioux & Jouis. **Action du bore sur la maladie de la Betterave.** [The action of boron on the Beetroot disease.]—*C. R. Acad. Agric. Fr.*, xxi, 27, pp. 1039–1042, 1935.

The writers obtained excellent control of heart rot of beet in Seine-Inférieure by the incorporation with the ordinary manure of 10 kg. sodium borate per hect. [see preceding abstract]. The soil in the experimental field was a sandy clay with a P_H of 7·8, almost destitute of boron (0·1 mg. per hect.). The treatment was given some three weeks before sowing on 15th May. Early in September about 75 per cent. of the plants in the untreated portion of the field were diseased, whereas all those receiving boron were in an absolutely sound condition. The weight of 100 treated beets was 87·2 kg. and that of the leaves 66 kg., the corresponding figures for the controls being 55 and 48·3 kg., respectively; the sugar content of the former was 16·96 and of the latter 14·72 per cent. Even more striking results were obtained in a neighbouring field of fodder beets.

It was shown by pot experiments that sodium borate, even at excessively high rates (corresponding to 100 kg. per hect.), did not retard the growth of white mustard, so that apparently no ill effects of the treatment on other crops need be feared.

Brandenburg (E.). **Die Brennflecken-Krankheit der Erbsen.** [The anthracnose disease of Peas.]—*NachrBl. dtsch. PflSchDienst*, xv, 11, p. 101, 1 fig., 1935.

As in Holland and the United States anthracnose of peas has been found in Germany to be associated with three fungi, viz., *Ascochyta pisi*, *Mycosphaerella pinodes*, and *A. pinodella* [*R.A.M.*, xii, p. 483; xiv,

p. 613; xv, p. 109], the two first-named being isolated in 1913 from 10 and 7 samples, respectively, of diseased material, while the corresponding figures for 1934 were 9 and 5, respectively; in the latter year one sample also yielded *A. pinodella*, which is readily distinguishable from the others by its smaller spores (average 8·1 by 4·1 μ). *A. pisi* and *M. pinodes* differ chiefly in their cultural behaviour, the former producing sparse mycelium and numerous light brown pycnidia with pale orange spore masses, turning the oatmeal substratum straw-yellow in old cultures, while the latter forms an abundance of dark mycelium and pycnidia and does not colour the medium. Perithecia with ripe spores were regularly produced in some of the cultures of *M. pinodes* but not in those of *A. pisi* or *A. pinodella*. In inoculation tests in which healthy peas were soaked for 24 hours in spore emulsions of the three fungi prior to sowing in sterilized soil, *A. pisi* did not attack either the stem base or roots, whereas the two others infected the stem base and *A. pinodella* also caused a certain amount of heavy damage to the roots. Evidently, therefore, the infection of the seed by the two last-named is likely to damage the crop more severely than invasion by *A. pisi*, which does not necessarily involve any loss.

ZAUMEYER (W. J.) & WADE (B. L.). **The relationship of certain legume mosaics to Bean.**—*J. agric. Res.*, li, 8, pp. 715–749, 6 figs., 1935.

In continuation of their studies of the relationship of the viruses of pea, white and alsike clover (*Trifolium repens* and *T. hybridum*), white and yellow sweet clover (*Melilotus alba* and *M. officinalis*), lucerne, red clover (*T. pratense*), and sweet pea mosaic diseases to beans (*Phaseolus vulgaris*) [*R.A.M.*, xii, pp. 414, 741; cf. also xv, p. 134], the authors give details of cross-inoculation experiments, the results of which showed that out of 31 [named] varieties of beans, 30 were susceptible to pea mosaic virus 2. This virus was obtained in 1931 from infected Dwarf Telephone peas in Colorado, and differs from the common pea mosaic mainly in that later in the season it produces on peas a pronounced vein clearing, while immediately adjacent to the larger veins the dark green tissue often persists, and the region between the veins is of a lighter shade than normal; yellow areas are often found, especially along the periphery of the leaves. The leaves and stipules of infected plants are smaller than normal; the plants are only slightly stunted, but the pods may be somewhat malformed and in some cases reduced in size. Pea mosaic virus 1 was not infectious to beans. The white clover mosaic virus caused typical symptoms on 29 of the 31 bean varieties inoculated, while white sweet clover mosaic virus infected 27, and lucerne mosaic virus infected 29 of the 31 varieties. Bean mosaic virus 3 was infectious to 24 out of the 30 varieties tested.

The three bean varieties resistant to the common bean mosaic, namely, Corbett Refugee, Great Northern Idaho No. 1, and Robust, did not react identically when inoculated with the viruses of the other legumes; the first was resistant only to the lucerne mosaic virus, the second was susceptible only to that virus, and the third was susceptible to the viruses of pea mosaic 2, white clover mosaic, and lucerne mosaic. In another series of experiments it was shown that the local lesions produced on beans by tobacco mosaic [ibid., ix, p. 810] and tobacco

ring spot [ibid., viii, p. 139] are different both in symptoms and varietal susceptibility from those produced by the mosaic viruses of white clover and lucerne, and that the various leguminous hosts showed differences in resistance and susceptibility when inoculated with the several legume mosaic viruses.

The thermal death points of the viruses were determined as follows: common bean mosaic, pea mosaic 2, and white sweet clover mosaic viruses, between 56° and 58° C.; white clover virus producing systemic infection of beans, between 58° and 60°; white clover virus causing local lesions on beans and the lucerne virus, between 62° and 65°. The viruses of the common bean mosaic, pea mosaic 2, and white sweet clover mosaic were not infectious at dilutions over 1 in 1,000, while those of the strains of white clover mosaic and of the lucerne mosaic were still infectious at a dilution of 1 in 2,000. *In vitro* the viruses of the common bean mosaic and white sweet clover mosaic lost their infectivity in 28 to 32 hours, that of pea mosaic 2 in 24 to 28 hours, that of the white clover mosaic producing local lesions on beans in 28 to 32 hours, and that of the strain causing systemic lesions in 32 to 48 hours; the lucerne virus was inactivated in 3 to 4 days. The viruses differed somewhat in their resistance to the action of hydrochloric acid, alcohol, and formaldehyde.

Field researches would indicate that the pea mosaic virus 2 is not as widespread as the common pea mosaic, and that lucerne mosaic is also limited in its dissemination; the mosaic diseases of white clover and white sweet clover, on the other hand, have been found in many localities, and it is assumed that they occur wherever the hosts are grown. Until bean varieties [cf. ibid., xv, p. 134] resistant to these diseases have been developed the crop should be grown as far as possible from clover fields, and all leguminous weeds growing in close proximity to beans should be removed and destroyed.

Böning (K.). **Die Blattfleckenkrankheit des Selleries.** [The leaf spot disease of Celery.]—*Obst- u. Gemüseb.*, lxxxi, 10, pp. 155–156, 1935.

In this account of celery leaf spot [*Septoria apii*: *R.A.M.*, xiii, p. 614] in Germany control measures recommended include the disinfection of fresh seed with one of the officially recognized preparations or the use of seed three to four years old, and regular treatment of the plants, from the seedling stage onwards, with a 1 to 2 per cent. copper-containing fungicide. It is also stated that liberal applications of potash to the soil considerably reduce the losses from leaf spot, while temporary benefit may also accrue from a top dressing with soluble nitrogen, which should be followed by other fertilizers. The delicate, so-called 'market' varieties of celery are the most susceptible to leaf spot.

Neergaard (P.). **Selleriskurv, fremkaldt af Alternaria radicina.** [Celery scab induced by *Alternaria radicina*.]—Reprinted from *Beretn. Nord. JordbrForskn. Kongr. 1935*, 7 pp., 1935.

In the spring of 1934 Prof. C. A. Jørgensen examined some celery

roots presenting the typical symptoms of scab (*Phoma apiicola*) in the form of a dry, brown, cracked crust a few millimetres in thickness, with which was interwoven a mycelium resembling that of *P. apiicola* in structure. Repeated isolations, however, uniformly yielded *Alternaria radicina*, hitherto known only as a parasite of carrots [*R.A.M.*, xiii, p. 740]. There was found to be no appreciable difference in susceptibility to infection through the soil by *A. radicina* between the Alabaster, Non Plus Ultra, and Amager Market varieties. The effects of inoculation of seedlings recalled the symptoms of damping-off and included a brown or black discoloration of the root and hypocotyl, accompanied in severe cases by a shrivelling of the tissues which eventually led to the collapse of the seedling; recovery was occasionally observed, however, in milder attacks involving only partial necrosis of the root system. *A. radicina* was re-isolated from some of the infected plants and used with positive results in a fresh series of inoculation tests. Although the environmental conditions in these trials were particularly conducive to infection, it seems not unlikely that *A. radicina* may attack celery seedlings in nature, more especially as Miss Doyer has shown it to be capable of causing a similar disease on carrots in Holland [ibid., xii, p. 72].

Of 31 one- and two-year-old Alabaster plants inoculated on the roots with the mycelium and spores of *A. radicina*, 28 contracted infection, while all the 22 controls remained healthy. *A. radicina* was re-isolated from some of the diseased roots. In 25 of the inoculated plants the fungus invaded all the aerial organs, causing a brown discoloration, shrivelling, and collapse of the tissues; the 6 that showed no symptoms on the foliage were inoculated out of doors at an extremely high temperature (maximum 43° in the sun), the upper limit for the growth of the pathogen, according to American observations, being about 39° [ibid., vi, p. 269]. *A. radicina* was re-isolated from the diseased leaves and inoculated with positive results into 14 plants.

Presumably in the field, where the fungus is capable of leading a saprophytic existence, young celery plants, like carrots, become infected through the petiole bases, whence the decay passes downwards to the root. The inflorescences of two-year-old plants may be destroyed and the seed infected, while the progeny of the latter may either be rapidly killed by the fungus or survive to harbour the pathogen and so aid in its continued spread.

TAUBENHAUS (J. J.). **Seeds of Watermelons and Okra as possible carriers of Fusarium wilt.**—Abs. in *Phytopathology*, xxv, 10, p. 969, 1935.

Fusarium [*bulbigenum* var.] *niveum* was recovered from all parts of the roots, stems, peduncles, rind, and a very small percentage of the interior of the seed of infected watermelon fruits [*R.A.M.*, xv, p. 256]. Similarly, *F. vasinfectum* was isolated from all parts of the roots, stems, pod tissue, and a very small proportion of the interior of the seed of okra [*Hibiscus esculentus*: ibid., ix, p. 378; xi, p. 183]. Evidently, therefore, the seeds of either infected watermelons or okra may act as internal carriers of *Fusarium* wilt.

TUCKER (C. M.). **Diaporthe phaseolorum on Pepper fruit.**—*Mycologia*, xxvii, 6, pp. 580–585, 2 pl., 1935.

A brief account is given of a rot of ripe and green chilli (*Capsicum annuum*) fruits which was observed in 1932 and 1933 in Columbia, Missouri, in the form of black, leathery, long, and narrow lesions, the dead tissue in which eventually becomes dry and bleached. The affected areas bear minute, subglobose, erumpent pycnidia, usually 200 to 300 μ in diameter, containing α and β spores characteristic of *Phomopsis*, a genus apparently not recorded hitherto on chilli in America. The former spores are continuous, ovoid to oblong-fusoid, hyaline, and measure 7·2 to 9·2 by 2·2 to 3·2 μ (average 7·9 by 2·7 μ); they develop first and germinate readily, while the latter develop later and rarely germinate. In pure culture the fungus grew well on all ordinary agar media; on potato dextrose agar it produced pycnidia, much larger than in nature, in about ten days; the young pycnidia contain both α and β spores, averaging 6·1 by 2·6 μ and 14·6 by 1·5 μ, respectively. In one-month-old cultures perithecia were found 150 to 300 μ in diameter, with a long, sinuous, irregular, carbonaceous, and ostiolate beak, usually in clusters, immersed in black, carbonaceous stromata; the asci are clavate, 34·2 to 44·1 by 7·2 to 9 μ, and contain eight obliquely monostichous, fusoid-ellipsoid, bicellular ascospores, constricted at the septum, and 9 to 11 by 2·5 to 3·5 μ (average 9·9 by 3·1 μ). Under laboratory conditions, inoculation of the fungus into detached, wounded chilli fruits caused a soft, wet rot spreading over the whole fruit.

Single ascospore cultures reproduced both the pycnidial and ascogenous stages, establishing the genetic connexion of the two forms, and proving the homothallic character of the fungus. The sexual stage was identified by Wehmeyer, to whom a culture was submitted, as belonging to the group recently described by him as *Diaporthe phaseolorum* [*R.A.M.*, xiii, p. 270]; the names *Phoma capsici* Magnaghi [ibid., ix, p. 227], *P. capsici* f. *caulicola* Bianchi (*Atti Ist. bot. Univ. Pavia*, ii, 9, p. 291, 1911), and *Phomopsis capsici* (Magnaghi) Sacc., all probably refer to the *Phomopsis* stage of the fungus.

STOREY (H. H.). **Virus diseases of East African plants: III.—Rosette disease of Groundnuts.**—*E. Afr. agric. J.*, i, 3, pp. 206–211, 2 figs., 1935.

A full, popular account is given of groundnut rosette, with particular reference to Tanganyika conditions [*R.A.M.*, xiii, p. 747], the chief points dealt with including the effects on the plant of the typical form of the disease as well as of the three forms differentiated in Sierra Leone [ibid., xiv, p. 739], transmission by *Aphis laburni*, range of plants affected and varietal resistance, methods of diagnosis, and control by destruction of self-sown plants in the off-season, the adoption of a uniform sowing date throughout a district, and close spacing.

HIGGINS (B. B.). **Breeding Peanuts for disease resistance.**—Abs. in *Phytopathology*, xxv, 10, pp. 971–972, 1935.

Since 1931 the writer has been breeding groundnuts with a view to

obtaining disease-resistant varieties better adapted to Georgia conditions than those now grown. A preliminary study of the data on some 200 crosses, including combinations between 15 varieties, indicates that in most of the characters under consideration the F_1 plants are intermediate between the parents, while in the second generation they segregate in approximate Mendelian ratios. Resistance to the two leaf spots, *Cercospora personata* and *C. arachidis* [*R.A.M.*, xiv, p. 82], appears to be inherited independently, selections very resistant to one often being highly susceptible to the other. Some hybrid strains are very susceptible and others highly resistant to *Sclerotium rolfsii* [ibid., xiv, p. 212].

PACCA (D. W.). **Sobre o 'Diplodia' da Manioca.** [On the Cassava '*Diplodia*'.]—*Rodriguésia*, i, 2, pp. 77–82, 5 pl., 1935.

In June, 1933, the author examined mummified cassava roots from two localities in Brazil, the cortex of which was wrinkled and bore subglobose pycnidia containing hyaline or dark, septate, longitudinally striated spores, measuring 24 to 30 by 12 to 18 μ, mixed with filiform paraphyses thickened at the apex. Other cassava roots showed the pycnidia of the same fungus completely immersed in the cortex, the spores being emitted in a long, gelatinous, hyaline, later black, cirrhus. Pycnidia identical with those seen in nature were developed in culture and the fungus is referred to *Diplodia* (*Botryodiplodia*) *theobromae; B. manihotis* Sydow is stated to differ from it chiefly in the absence of paraphyses.

Inoculations with pure cultures of the fungus on wounded and unwounded surfaces of fully grown cassava (*Manihot palmata* var. *aipi*) roots, incubated in a damp chamber at laboratory temperature, all gave positive results, but other experiments were negative, and the author considers that *B. theobromae* is a weak parasite attacking only wounded or sickly cassava roots. The disease may, however, become serious in storage, where most of the spoilage in cassava was ascertained to be due to it. Cacao fruits were successfully infected by the fungus with the production of characteristic symptoms, and on re-isolation it was inoculated into other cacao fruits and also into cassava roots again with positive results.

It is stated in an appendix that a cassava root disease 'saporema' which affected 40 per cent. of the plants in one locality was associated with *B. theobromae* and a fungus with rhizomorphs resembling a *Rosellinia*; from data supplied by other Brazilian workers the author considers that *Armillaria mellea* may also be associated with the condition.

UPPAL (B. N.) & KULKARNI (N. T.). **Fusarium wilt in Sann Hemp.**—*Curr. Sci.*, iv, 5, pp. 314–315, 1935.

In this preliminary note the authors state that cross-inoculation experiments in soil temperature tanks at 28° C. demonstrated that cultures of *Fusarium vasinfectum* from sann hemp (*Crotalaria juncea*) did not infect pigeon pea [*Cajanus cajan*] and vice versa, though the control plants in all cases showed a high percentage of deaths; these results do not confirm those reported by Mitra, working on the same lines [*R.A.M.*, xiv, p. 144].

Oltarjevski (N. P.). К вопросу об изучении некоторых экологических факторов в развитии мильдью Винограда.—[A note on the study of certain ecological factors in the development of Vine mildew.]—*Советск. Бот.* [*Sovetsk. Bot.*], *1935*, 4, pp. 77–80, 1935.

A few details are given of laboratory experiments, the results of which showed that when vine leaves exhibiting oily patches, but still devoid of vine mildew (*Plasmopara viticola*) conidia, were collected just after sunrise and kept in the dark, they developed the conidial efflorescence within seven or eight hours (about 2 or 3 p.m.), while similar leaves kept in daylight but out of direct sunlight, produced the efflorescence about twelve hours later (2 or 3 a.m.). In another series of experiments it was shown that the production of the conidia was proportionately delayed by gradually increasing the intensity of the light to which the leaves were exposed. There also was evidence that oily spots of longer standing required a longer exposure to darkness, occasionally reaching ten or eleven hours, than newly formed patches to produce the conidia.

Records in the Caucasus, where the climate is of the continental type, show that visible outbreaks of vine mildew may follow nights with a temperature minimum between 13° and 10° C. [*R.A.M.*, xiv, pp. 9, 421], provided this minimum occurs just before sunrise.

Garbowski (L.). **Choroby roślin użytkowych w okresie 1931–1933 r. Zestawienie notowań Zakładów Ochrony Roślin.** [Diseases of useful plants in the period 1931–1933. A summary of the observations of the Plant Protection Stations.]—*Roczn. Ochr. Rośl.*, Cz. A (Choroby roślin), ii obejm. okres 1931–1933 r. [*Plant Prot. Yearb.*, Ser. A (Plant diseases), ii for period 1931–1933 incl.], Bydgoszcz, pp. 406–580, 1935.

This is a complete list, arranged under the hosts, of records of fungal, bacterial, virus, and physiological diseases of field crops, useful and ornamental plants, and forest trees which were made by the various Plant Protection Stations of Poland [see below, p. 306] during the period from 1931 to 1933, inclusive, the locality and date of the record being cited in each case. A few notes are also given on varietal differences in resistance of some of the more important crops, such as potatoes, wheat, barley, and the like, to certain of the diseases.

Sprawozdania z działalności Zakładów Ochrony Roślin. [Reports on the activities of the Plant Protection Stations.]—*Roczn. Ochr. Rośl.*, Cz. A (Choroby roślin), ii obejm. okres 1931–1933 r. [*Plant Prot. Yearb.*, Ser. A (Plant diseases), ii for period 1931–1933 incl.], Bydgoszcz, pp. 9–235, 1935.

This paper consists of the reports of the Polish regional plant protection stations and their sub-stations, each signed by the Director or responsible officer, of their administrative, scientific, and practical activities from 1931 to 1933, inclusive, in the control of the diseases and pests of the chief cultivated crops, ornamental plants, and forest trees in Poland. Most important was the work of controlling potato

wart disease (*Synchytrium endobioticum*), especially in small holdings and in gardens in industrial centres. The task is stated to have been greatly handicapped by the difficulty of inducing the poorer population to grow the wart-resistant potato varieties recommended by the authorities. The only effective measure to enforce the adoption of such varieties is to compel the growers of wart-susceptible potatoes to dig them up and to destroy them *in loco* under administrative supervision, without the payment of any monetary compensation.

A heavy outbreak in 1932 of cereal rusts, especially of wheat black rust (*Puccinia graminis*) induced many of the stations to resume their campaign for the elimination of barberries from their territories. Cereal smuts (chiefly *Tilletia caries*, *Ustilago avenae*, and *Urocystis occulta*) were also rather prevalent in certain regions, and this led to the testing by the stations of numerous old and new methods of seed-grain disinfection [see below, p. 284].

Su (U. T.). **India: new diseases of crops during the year 1934–1935 in Burma.**—*Int. Bull. Pl. Prot.*, ix, 12, p. 273, 1935.

The following diseases with six others were newly recorded during the period under review: *Cercospora henningsii* on cassava [*R.A.M.*, xv, p. 59]; *Choanephora cucurbitarum* on chilli [ibid., xi, p. 803]; and *Macrosporium parasiticum* [*Pleospora herbarum*] on *Allium* sp. [ibid., xiii, p. 614].

Noble (R. J.). **Australia: notes on plant diseases recorded in New South Wales for the year ending 30th June 1935.**—*Int. Bull. Pl. Prot.*, ix, 12, pp. 270–273, 1935.

During the period under review oats in New South Wales were attacked by *Bacterium striafaciens* and rye by *Bact. translucens secalis* [*R.A.M.*, xi, p. 434]. Maize suffered from poor germination and seedling blight following infection by *Gibberella moniliformis* and *G. fujikuroi* var. *subglutinans* [ibid., xv, p. 12], the former being also mainly responsible for cob and grain rot, though *Diplodia zeae* was more prevalent in the cooler tableland areas. Sorghum was seriously affected by *Colletotrichum graminicolum* [ibid., xiv, pp. 286, 494, 575] and *Bact.* (?) *holcicola* [ibid., xiv, p. 562].

Pears were recorded for the first time as the host of a powdery mildew (*Podosphaera* sp.). Unusually heavy losses were caused by brown rot (*Phytophthora hibernalis*) [ibid., xiv, p. 315] of citrus, while the root rots due to *Armillaria mellea* [ibid., xi, p. 40] and *Ganoderma* sp. were of considerable local importance. During the autumn and winter leaf yellowing, associated with magnesium deficiency, also attracted attention. *Fomes pomaceus* [ibid., xiv, p. 375] was observed for the first time on peaches.

The wilt stage of bacterial tomato canker (*Aplanobacter michiganense* [ibid., xiv, p. 348] was detected for the first time in field crops, and another new record for the Colony was *Fusarium orthoceras* var. *pisi* on peas [ibid., xiv, p. 613]. The tomato spotted wilt virus occurred on dahlias [ibid., xiv, p. 201] and *Schizanthus* [ibid., xiv, p. 662].

SIMMONDS (J. H.). **The work of the Pathological Branch.**—*Rep. Dep. Agric. Qd, 1934–1935*, pp. 72–74, 1935.

This report contains the following items of phytopathological interest apart from those already noticed from other sources [cf. *R.A.M.*, xiv, p. 216]. In a spraying experiment against blue mould of tobacco (*Peronospora hyoscyami*) [*P. tabacina*: ibid., xv, p. 121] the best control was obtained by colloidal copper (1 in 30) plus 0·5 per cent. potash soap as a spreader. Both colloidal copper and copper emulsion gave encouraging results in the field. The large leaf spot of bananas caused by *Cordana* [*Scolecotrichum*] *musae* [ibid., xiv, p. 45], formerly rarely found in southern Queensland, occurred with greatly increased intensity. A black tip disease of green banana fruits was associated with a fungus apparently identical with *Helminthosporium torulosum* [ibid., xiv, p. 323]; the condition has hitherto been rather infrequent in Queensland. The evidence obtained as to the relative importance of the organisms associated with banana black end largely confirmed Miss Hoette's findings for the Melbourne markets [ibid., xv, p. 104] in showing that the greater part of the loss caused is due to *Gloeosporium musarum*.

Home-made colloidal copper (1 in 13) gave promising results in the control of brown spot on Emperor mandarin oranges [*Phoma citricarpa*: ibid., xiv, p. 216] and is considered likely to prove a useful substitute for Bordeaux mixture on citrus as it also resulted in much less scale insect infestation than when Bordeaux mixture was used.

Pineapple black heart [loc. cit.] was prevented by enclosing the fruit in paper bags, but the amount of labour necessary rendered the commercial application of this procedure impossible.

Sulphur and copper sprays and a sulphur-copper sulphate dust all effectively controlled papaw powdery mildew, caused by a species of *Sphaerotheca* [loc. cit.], though Bordeaux mixture and colloidal copper produced severe scorching of the young leaves even when used at reduced strengths.

A *Rhizoctonia* caused considerable loss from root rot to hoop pine (*Araucaria cunninghamii*) nursery stock in the Brisbane Valley area. In field tests spraying with lignasan [ibid., xiv, p. 729] gave promising results against blue stain of *A. cunninghamii*, but it is doubtful whether spraying will prove economically practicable under Queensland conditions.

Botany. *Ex* Work of the Agricultural Experiment Station. Report of the Director for the year ending June 30, 1934.—*Bull. Mo. agric. Exp. Sta.* 358, pp. 37–41, 1935.

The following investigations were conducted by C. M. Tucker (in collaboration with C. G. Schmitt in the damping-off tests). Experiments are in progress in the development of rhubarb varieties resistant to foot or crown rot (*Phytophthora parasitica*) [*R.A.M.*, xiii, p. 14], which is so virulent in the State as to limit home production.

Bacterium pruni [ibid., xiv, p. 220; xv, p. 235] was isolated from the gum-filled cavities formed in the hypertrophied woody tissues of cankers on budded sweet cherry trees, the cambium and cortex of which were destroyed while a wedge-shaped mass of dead xylem extended

to the pith. The young trunks were attacked at any point between the bud union and a height of some 18 in. and from one to a dozen cankers were observed. The Black Tartarian, Bing, and Schmidt's Big varieties were more susceptible than Lambert. Inoculation experiments with *Bact. pruni* on Bing gave positive results without, however, affording proof as to the capacity of the organism to produce cankers under natural conditions.

A severe canker of Starking, Stayman, Winesap, and Golden Grimes apples was associated with a *Phoma*-like fungus, the action of which, however, is believed to be only secondary. The cankers were either scurfy or circular and well-defined, of the target type. Badly affected branches died back from the tips and small islands or streaks of brown, necrotic tissue appeared in the cortex.

The best control of loose smut of Spartan barley [*Ustilago nuda*] was obtained by prolonged immersion of the seed-grain in water at 45° to 48° C.

Good control of damping-off (*Pythium de Baryanum*) in Bonny Best tomatoes was given by seed treatment with 1 gm. Du Bay 738 or 0·5 gm. new improved ceresan [ibid., xiv, p. 146; xv, p. 10]. Ethyl mercury phosphate (a constituent of both the foregoing) was tested on 1,500 seeds each of a number of garden plants to determine its effect on damping-off. It increased the number of plants and caused no injury to various crucifers, spinach, and asparagus at the rate of 2 gm. per 5 in. pot of soil, but at 1 gm. it markedly retarded germination and caused some stunting in pepper [*Capsicum annuum*], eggplant, beet, and tobacco, while at 2 gm. cucumber, celery, lettuce, and beans [*Phaseolus vulgaris*] were similarly injured.

Division of Botany.—*Rep. N.Y. St. agric. Exp. Sta., 1934–1935,* pp. 30–36, 1935.

This report, which is on the same lines as those for previous years [cf. *R.A.M.*, xiv, p. 218], contains among others the following items of phytopathological interest. Under western New York conditions the newly introduced Potomac variety of purple raspberry [*Rubus neglectus*] escapes green mottle mosaic (formerly called red raspberry mosaic) [loc. cit.] exceptionally well for a purple variety, but has not been adopted by growers because its fruit is inferior in quality to Columbian. Stock of the recently named and introduced Sodus purple raspberry is mosaic-free, and it is hoped that its present promise will be maintained and that it will rapidly replace Columbian.

The so-called strawberry mosaic [cf. ibid., xii, p. 204], 'June yellows', is increasing every year in stock of the standard Premier variety in the Chautauqua and Eerie counties of New York, the Chesapeake and Marcus varieties being affected for the first time in 1935.

Stewart's wilt disease of maize [*Aplanobacter stewarti*: ibid., xv, p. 211] was absent in 1934, after being epidemic during the years 1931 to 1933. Owing to drought tomato blossom-end rot was very serious.

During the period under review approximately 20,000 bushels of Surprise pea seed were treated with red [cuprous] copper oxide [ibid., xiv, p. 673] to prevent decay, and on an average between 20 and 30 per cent. of the seeds were saved. Tests with the substance as a spray

and dust fungicide showed it to be highly efficient [ibid., xiv, p. 382]. Used as a spray against hop downy mildew [*Pseudoperonospora humuli*: ibid., xiv, p. 191], which appeared in New York in epidemic proportions, it did not stunt the cones, as Bordeaux mixture did, though both sprays checked the disease satisfactorily.

The treatment of potato seed tubers with yellow oxide of mercury (1 lb. per 15 galls. of water) again markedly delayed emergence but increased the yield of Irish Cobbler considerably, and of Green Mountain very slightly. When calomel [mercurous chloride] or yellow oxide of mercury was mixed with a fertilizer at the rate of 2, 4, and 6 lb. per ton and applied to potatoes against scab [*Actinomyces scabies*: ibid., xiv, p. 150], the percentage of clean tubers was much higher on the plots treated with the two larger amounts than on the untreated controls; there seemed to be little difference in the fungicidal value of the two materials.

Winter vetch [*Vicia villosa*] is frequently attacked in New York by *Ascochyta pisi viciae*, introduced into the field by the sowing of infected seed. Seed from the southern States often showed 15 to 20 per cent. infection, while that from a few European countries was clean, though the seed from other exporting areas carried 5 to 20 per cent. infection.

Van Hook (J. M.). **Indiana fungi, XIII.**—*Proc. Ind. Acad. Sci.*, xliv (*1934*), pp. 55–64, 1935.

The following are among the many records of interest in this list [*R.A.M.*, x, p. 84]. *Phyllosticta fallax* Sacc. & Roum., characterized by pycnidia 50 to 100 μ in diameter, and chlorine- to dark-coloured spores 3 by 5 μ, was detected on *Acer saccharinum* leaves, this being apparently the first record of the fungus in the United States. Violets were attacked by *Septoria violae* var. *rostrata* n.var., characterized by filiform, straight or curved spores, 20 to 30 by 1 to 1·3 μ, with conspicuously dark beaks; the spots formed by the fungus measure 0·5 to 3 mm. in diameter and are circular, pallid to brownish-yellow, with a reddish-brown border. *Trichothecium roseum* [ibid., xiv, p. 569] occurred in a destructive form on fern (*Pteris longifolia*) prothallia, causing damping-off. Parsnips were attacked by *Cercospora pastinacae*. *Valsa* (*Cytospora*) *leucostoma* was found on peach [cf. ibid., xv, pp. 15, 162] and *Prunus* sp. in a parasitic form. In 1915 an entire lot of *Cosmos* was killed by *Phomopsis stewartii* [ibid., xv, p. 100] (diagnosed at the time as a *Phlyctaena*).

Roger (L.). **Notes de pathologie végétale.** [Notes on plant pathology.] —*Agron. colon.*, xxiv, 215, pp. 139–147, 1935.

Brief popular notes are given on the following fungal diseases found on material received from French possessions overseas: *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: *R.A.M.*, xiv, p. 653] occurred on leaves and grain of *Oryza montana* from Togo, and *Rosellinia* (?) *necatrix* [ibid., x, pp. 659, 775; xiv, p. 176], provisionally identified from mycelium and rhizomorphs only, caused in Bangui a root and collar rot of coffee, with defoliation in two or three weeks, followed by die-back. *Colletotrichum coffeanum* [ibid., xiii, pp. 114, 367; xiv, p. 32] was responsible for a die-back of coffee in French Guinea, the losses in one

locality being estimated at over 50 per cent. The 'cherries' on the affected branches were small and became severely infected by *Cercospora coffeicola*.

H. torulosum [see above, p. 281] was found in French Guinea on bananas blackened at the tip. The disease is stated to be most prevalent in wet, hot seasons and old, over-thick or badly drained plantations. *C. personata* [ibid., xiii, p. 747; xiv, p. 212] occurred on ground-nuts from Togo. The young plants had been imported from Nigeria, and the attack began as soon as germination started; no crop was obtained, and all the plants had to be destroyed. It is stated that while the fungus rarely fructifies in the dry climate of Senegal it does so frequently in the more humid regions of French West Africa.

HART (HELEN) & ZALESKI (K.). **The effect of light intensity and temperature on infection of Hope Wheat by Puccinia graminis tritici.**—*Phytopathology*, xxv, 12, pp. 1041–1066, 6 figs., 1935.

Under the normal conditions of intense sunlight prevailing in the Upper Mississippi Valley, Hope wheat plants at various phases of development beyond the seedling stage appear to possess a fair degree of resistance to *Puccinia graminis tritici* 21 [*R.A.M.*, xiv, p. 747], but when the intensity of the light is reduced by shading the plants, they become as completely susceptible to the rust as they are in the seedling stage. High temperatures (29° to 33° C.) were found to confer the same apparent resistance to *P. graminis tritici* 21 as intense sunlight. Such pustules as were formed were minute, no spores developed, and hypersensitive flecks, pigmentation, and chlorosis were abundant. These data would seem to support the view that environmental factors influence the host-parasite complex as a whole rather than its component parts [ibid., xi, p. 628].

LESZCZENKO (P.). **Zestawienie wyników doświadczeń nad skutecznością środków grzybobójczych wykononych w Polsce w latach 1918–1933.** [A summarized report of the results of efficacy tests of fungicides, which were carried out in Poland in the period 1918–1933.]—*Roczn. Ochr. Rośl.*, Cz. A (Choroby roślin), ii obejm. okres 1931–1933 r. [*Plant Prot. Yearb.*, Ser. A (Plant diseases), ii for the period 1931–1933 incl.], Bydgoszcz, pp. 236–394, 1935.

In a brief introductory note the author states that the tables which form the bulk of this paper (pp. 246–387) embody the summarized results of all but a few of the tests which have been carried out in Poland from 1918 to 1933 to determine the relative fungicidal efficacy of some 70 chemical substances and proprietary preparations already in common use or newly recommended for the control of fungal diseases of various cultivated field and ornamental plants. For each disease are listed the fungicides tested, the locality, author, and year of the test, the concentration used, the method of application, the result, in percentages, of the treatment, and the host varieties included in the test, together with incidental notes. For annual crops, the effects of the fungicides on germination of healthy seeds are also tabulated.

Steeping smutted cereal seed-grain for 15 to 30 minutes in 0·1 to 0·15 per cent. formaldehyde solution gave complete control of wheat

bunt (*Tilletia tritici*) [*T. caries*], stripe smut of rye (*Urocystis occulta*), loose smut of oats (*Ustilago avenae*), and smut (*U. panici-miliacei*) [*R.A.M.*, xiii, p. 749] of millet [*Panicum miliaceum*]. This treatment applied to smut-free seed-grain usually resulted, especially with wheat, in increased yields. Almost equally good control of the smuts was afforded by steeping the seed-grain for 15 to 30 minutes in a 0·25 to 0·5 solution of a proprietary mixture of cupric and cuprous sulphites manufactured by Mg. Klawe under the name 'granosan' [cf. ibid., xiv, p. 809]; in laboratory tests, however, this preparation appeared to depress somewhat the germination and early growth of wheat, this effect being obliterated later in the season. Among organic mercury compounds, excellent control of wheat bunt, loose smut of oats, and stripe smut of rye was afforded by steeping the grain in 0·5 per cent. uspulun or 0·125 to 0·25 per cent. germisan for one hour. Both substances in the laboratory significantly stimulated the germination of the cereals, and in the field tests markedly increased their yield in grain. Highly satisfactory control of the cereal smuts was obtained by the local dusts 'ziarnik' [abavit B] and No. 413 [see next abstract] of the 'Azot' Works, both preparations stimulating germination and increasing the yield. Of foreign dusts, good control of the smuts was given by uspulun and germisan dusts, at doses of 0·25 to 0·5 per cent. and 0·25 to 0·3 per cent., respectively. American copper carbonate dust did not control the smuts commercially.

Considerable reduction in the severity of primary outbreaks of *Cercospora beticola* [ibid., xv, p. 193] on sugar beets was obtained by steeping infected seed-clusters in 0·1 to 0·2 per cent. formaldehyde solution for 15 to 30 minutes, or in 0·5 per cent. uspulun, 0·25 per cent. germisan, 0·5 per cent. tillantin, or 0·25 to 1 per cent. annogen-annogran for 1 hour.

Zaleski (K.) & Dorywalski (J.). **Dwuletnie doświadczenia polowe z zaprawanie nad zwalczaniem śnieci cuchnącej u Pszenicy ozimej Edel-Epp (z lat 1932/33 i 1933/34.)** [Two years' field experiments in the control of bunt in Edel-Epp winter Wheat (in 1932–1933 and 1933–1934.)]—*Roczn. Nauk rol., Poznań*, xxxv, 3, pp. 444–455, 1935. [English summary.]

The results [which are discussed and the statistical data tabulated] of two years' experiments under exceptionally favourable conditions in the control of bunt (*Tilletia tritici*) [*T. caries*] in Edel-Epp winter wheat at the Faculty of Agriculture and Forestry, Posen University [*R.A.M.*, vii, p. 624], showed the best of the treatments tested to be abavit B (known in Poland as 'ziarnik') [see preceding abstract] and germisan dusts (200 and 300 gm. per 100 kg. seed-grain, respectively), and immersion for 15 minutes in 0·25 per cent. formaldehyde or for 5 minutes in 1 per cent. copper sulphate followed by 5 to 10 minutes in 1·5 per cent. milk of lime. In one year's trials both Polish and American brands of copper carbonate (200 and 285 gm. per 100 kg., respectively), Polish and German uspulun (200 and 350 gm. per 100 kg., respectively), and a new Polish dust known as '413 a' [see preceding abstract] proved efficacious, while satisfactory control was also given by 30 minutes' immersion in 0·25 per cent. German uspulun, 15 minutes

in 1·3 per cent. Bordeaux mixture, the same in germisan (60 gm. in 3 l. water per 100 kg.), and sprinkling with 0·25 per cent. formaldehyde in 10 l. water per 100 kg. The choice of any one of these treatments should depend on economic considerations, which will naturally vary according to local agricultural conditions.

MUNCIE (J. H.) & FRUTCHEY (C. W.). **Field trials on control of Wheat stinking smut by dust fungicides.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xvii, 4, pp. 189–192, 1935.

A tabulated account is given of the results of three years' tests on the comparative efficacy of a number of dry and liquid preparations in the control of wheat bunt (*Tilletia levis*) [*T. foetens*] in the Red Rock and American Banner varieties, from which it appears that the most satisfactory were sanoseed [*R.A.M.*, xiv, p. 118], containing 5 per cent. ethanol mercury chloride, Heyden dust (3·4 per cent. mercury+30 per cent. copper carbonate), Paris green (25 per cent. copper carbonate+60 per cent. arsenic trioxide), and Du Bay 655 [ibid., xi, p. 634] (2 per cent. ethyl mercury), reducing the incidence of infection from 37·8 to 0·21, 0·30, 0·43, and 0·43 per cent., respectively. The next most effective were 50 per cent. copper carbonate, Du Bay 986 (2 per cent. ethyl mercury phosphate), and saatbeize P. 237 (15 per cent. mercury+arsenic+copper carbonate), while a number of other treatments, including 2 per cent. ethanol mercury iodide, copper oxychloride [ibid., xiv, p. 562], and 20 per cent. copper phosphate gave interesting indications.

HURST (W. M.), HUMPHRIES (W. R.), LEUKEL (R. W.), & BOERNER (E. G.). **Removing smut balls from seed Wheat.**—*Circ. U.S. Dep. Agric.* 361, 16 pp., 6 figs., 1935.

In this account of an investigation of the ability of a number of grain-cleaning machines to remove stinking smut [bunt: *Tilletia caries* and *T. foetens*] balls from wheat seed the authors state that bunt balls separated by hand from soft red winter wheat varied from 0·0763 to 0·134 gm. (average 0·0963 gm.) in weight per 10 bunt ball lots as against 0·3063 to 0·3637 gm. (average 0·332 gm.) for the sound grain (10 grain lots), the corresponding average figures for Purplestraw wheat being 0·0795 and 0·3090 gm. The balls appear to differ considerably in size and shape with different physiological forms of bunt [cf. next abstracts] and different wheat varieties. Some are much smaller and others larger than the healthy wheat grain from which they are taken. Preliminary tests made with farm-sized grain-cleaners indicated that some of the balls may be screened out and a large percentage removed by air blast, but complete removal should not be expected with the type of equipment usually employed.

As a result of a large number of experiments, the data from which are tabulated, it was found that grain-cleaning machines of the fanning-mill type were more effective than other types for the removal of bunt balls. By adjusting the air velocity, screen size, and rate of feed it was possible to remove all the bunt balls from infected grain, two machines effecting this in one operation. A blast of air when directed upward against the falling grain was more effective, especially at low velocities,

than when striking the grain at right angles. In general the best results were obtained when the machines were run well below their rated capacity.

HOLTON (C. S.). **Studies on seven differentiating characteristics of two physiologic forms of Tilletia tritici.**—*Phytopathology*, xxv, 12, pp. 1091–1098, 3 figs., 1935.

Seven differential characters were recognized in two physiologic forms of *Tilletia tritici* [*T. caries*] attacking Hohenheimer wheat in the State of Washington [*R.A.M.*, xiv, p. 287]. In addition to their varying degree of virulence on the variety concerned—the Pullman form causing an average of only 33 per cent. damage over a three-year period compared with 81 per cent. for that from Lind—the two forms differ in the type of smut [bunt] ball [cf. preceding abstract], prominence of spore-wall reticulations, spore diameter, promycelial length, nuclear behaviour during chlamydospore germination, and relative degree of stunting caused. In the Pullman form the bunt balls are large and elongated, in the Lind small and somewhat rounded; in the former the spore-wall reticulations are relatively inconspicuous, whereas in the latter they are so prominent as to impart a somewhat spiny appearance [cf. ibid., xii, p. 618]. The mean spore diameter (252 spores) of Pullman was found to be $17 \cdot 85 \pm 0 \cdot 03\ \mu$ as against $19 \cdot 31 \pm 0 \cdot 04\ \mu$ in Lind, the corresponding figures for promycelial length being $72 \cdot 60 \pm 1 \cdot 60\ \mu$ and $21 \cdot 45 \pm 0 \cdot 39\ \mu$, respectively. The nuclei of the Pullman form were scattered during the germination process, while those of Lind remained aggregated. The mean heights of culms of the Hosar variety infected by the Pullman and Lind forms were $99 \cdot 80 \pm 0 \cdot 52$ cm. and $92 \cdot 84 \pm 0 \cdot 43$ cm., respectively, compared with 118·48 cm. for healthy plants. Three of these differences, namely, chlamydospore diameter, promycelial length, and nuclear behaviour, do not appear to have been previously reported. In conclusion the author suggests that characters other than pathogenicity should be considered in classifying the various physiologic forms of *T. caries* and *T. levis* [*T. foetens*].

SCHLEHUBER (A. M.). **Wheat inheritance: reaction to four bunt biotypes, spike density, and seed color.**—*Bull. Wash. St. agric. Exp. Sta.* 323 (Tech. Paper), 32 pp., 5 graphs, 1935.

The F_3 progeny of crosses between Albit and Minhardi and between Albit and Buffum 17 wheats were found to be completely susceptible to two biotypes (T13 and T2) of bunt (*Tilletia tritici*) [*T. caries*: see preceding abstract and *R.A.M.*, xiii, p. 361] virulently attacking all parents, but reactions ranging from immunity to absolute susceptibility were obtained in the same generation inoculated with another biotype (T1) of *T. caries* and one (L5) of *T. levis* [*T. foetens*] which spare Albit while severely infecting Minhardi and Buffum 17. In the F_3 generation of the Albit×Minhardi cross the four classes, bunt-free, intermediate resistant, intermediate susceptible, and susceptible, gave a close approximation to a 7: 4: 4: 1 ratio to form T1, indicating a two-main-factor difference. The coefficient of correlation between T1 and L5 ($r = 0 \cdot 956 \pm 0 \cdot 008$) denotes that the same two main factors responsible for resistance to T1 confer the same reaction to L5. Minhardi introduces

a factor inhibiting the action of A(lbit)[1] against L5 but not against T1. Neither Albit, Minhardi, nor Buffum 17 possess genes for resistance to forms T13 and T2. Segregates more susceptible than Buffum 17 developed among the progeny of the crosses, and it is possible that this variety carries a factor, C, reducing the incidence of bunt and another, Ib, inhibiting the action of both A^1 and A^2.

CARRÉ (G.). **A propos de la lutte contre le piétin.** [A note in connexion with the campaign against foot rot.]—*J. Agric. prat., Paris*, N.S., xcix, 52, p. 540, 1935.

The yield of mixed plots on silico-argillaceous soil of Vilmorin 27, Hybride 40, and Hybride de Jonquois wheat was appreciably increased and the incidence of foot rot [*Cercosporella herpotrichoides*: *R.A.M.*, xv, p. 145] reduced to a minimum at the Wagnonville Agricultural College, Douai, by 500 kg. superphosphate per hect. (*a*) incorporated with the soil on 5th December, 1934, or (*b*) applied as a top dressing on 12th April, 1935, the yields per hect. being (*a*) 3,690 and (*b*) 4,047 kg., compared with 3,447 kg. for the ordinary fertilizer treatment.

JOHNSTON (W. H.) & AAMODT (O. S.). **The breeding of disease-resistant smooth-awned varieties of Barley.**—*Canad. J. Res.*, xiii, 5, pp. 315–338, 1 fig., 1 diag., 1935.

An account is given of the results obtained up to date in the work which was started in 1929 at the University of Alberta, Edmonton, for the purpose of developing simultaneously smooth-awned and disease-resistant varieties of barley, suitable for the conditions prevailing in Alberta, from reciprocal crosses of the two smooth-awned varieties Glabron and Velvet and the rough-awned Trebi. The part of the work relating to resistance of the progeny to *Ustilago hordei* was reported in previous communications [*R.A.M.*, xiv, pp. 158, 623]. In regard to barley loose smut [*U. nuda*], the authors refer to recent work on the types of barley smut intermediate between *U. hordei* and *U. nuda* [ibid., xiii, p. 691; xv, p. 211], and state that these types doubtless occur in Canada, where the disease is widespread, but as they have not as yet been differentiated no progress has been made in the development of resistant varieties.

A full review is also given of the literature dealing with the methods of infection of barley with stripe (*Helminthosporium gramineum*) [ibid., xiv, p. 746], the temperature relations, physiologic specialization, genetic studies, and methods of inoculation of the causal fungus. In the Edmonton studies of the resistance to stripe of the reciprocal crosses of Trebi and Glabron, the plants were inoculated chiefly with *H. gramineum* obtained from the Canadian Thorpe variety; the inoculation consisted in dipping random ears in the spore suspension and immediately enclosing them in glassine bags which were kept moist by atomizing every four or five days. The grains from the inoculated ears were sown in the spring of 1932 at soil temperatures ranging from 10° to 13° C. The results indicated that the Trebi parent was highly resistant to the form of *H. gramineum* used, 39 plants of 47 being completely immune and 8 showing 3 per cent. infection, while the Glabron barley showed infection ranging from 3 to 28 per cent., the majority

of the lines showing from 8 to 13 per cent. infection. This wide range is considered to suggest the existence of certain limitations in the inoculation methods which were used. There was no evidence of transgressive reaction for greater resistance. In general the results bore out Isenbeck's conclusion [ibid., x, p. 231] that the number of resistant individuals in hybrids increased with the degree of resistance of the two parents, but it is extremely difficult to postulate any definite mode of inheritance of resistance.

A slight positive correlation was found between percentage stripe infection and mean height of the plant, but none between stripe reaction and either mean number of days from emergence or barbing of awns.

H[owie] (G. W.). **Improving the returns from Oats. Experiments to prevent the development of leaf stripe disease.**—*Manx J. Agric.*, ii, 1, pp. 36–38, 1 diag., 1935.

Details are given of experiments carried out in 1932 and 1933 at the Knockaloe Experimental Farm, Isle of Man, to determine the efficacy of ceresan (2 oz. per bush.) in the control of leaf stripe of Victory oats [*Helminthosporium avenae*: *R.A.M.*, xv, p. 73 and next abstract]. In 1932 the increased return per acre in the treated plots sown at the rate of 4 bush. per acre was estimated at 13*s.* 4½*d.* (with ceresan at 2*s.* 2*d.* per lb.) and in 1933 the increased returns per acre for a sowing of treated seed at 6 bush. per acre were 2*s.* 2¾*d.*, at 5 bush., 7*s.* 8½*d.*, and at 4 bush., £1. 5*s.* 5¼*d.*

[Howie (G. W.).] **Improving the returns from Oats. Results of a further experiment with 'ceresan'.**—*Manx J. Agric.*, iii, 1, pp. 7–8, 1936.

In 1935 the increased returns per acre of oats treated with ceresan (2 oz. per bush.) against leaf stripe [*Helminthosporium avenae*] at the Knockaloe Experiment Farm, Isle of Man [see preceding abstract], were as follows: 6 bush. seed-grain per acre, 3*s.* 11½*d.*, 5 bush., 9*s.* 6¼*d.*, and 4 bush., £1. 0*s.* 9*d.*

Valleau (W. D.). **Seed transmission of Helminthosporium of Corn.**—*Phytopathology*, xxv, 12, pp. 1109–1112, 1935.

Evidence is adduced that, contrary to the observations of Koehler and Holbert in respect of *Helminthosporium turcicum* in Illinois [*R.A.M.*, x, p. 180], *H.* sp. is commonly present in maize seeds in Kentucky though very liable to escape notice owing to the routine plate-culture methods of investigation. Its presence may be readily determined, however, in surface-disinfected seeds planted in clean sterilized sand in a room with subdued light and maintained for a sufficient length of time at a temperature of about 80° F. [ibid., v, p. 605], being consistently associated in the writer's tests with the development on the seed coats of coal-black markings in contrast to the red and dark olive discolorations characteristic of *Fusarium moniliforme* [*Gibberella moniliformis*] and *Alternaria* sp., respectively. The longevity of sand-box seedlings from a given ear compared with that of seedlings from other ears appears to be an inherited character and not an indication of the degree of infection of the seeds with pathogenic organisms. Of 269 plants or seed remnants examined *H.* sp. was

detected on 32 seeds (11·9 per cent.) from 13 out of 15 smooth (and thus apparently fungus-free) ears, *G. moniliformis* on 94, and *A.* sp. on 11. The first-named was fruiting abundantly either on the black areas of the seed coats or on the mesocotyl. A perusal of earlier records on pericarp discoloration indicates that 28·5 per cent. of 2,058 seeds of the Boone County White variety and 47·4 per cent. of 1,069 of Reid's Yellow Dent were attacked by *H.* sp. Infection is believed to occur through the silks soon after pollination, the fungus penetrating between the pericarp layers and sometimes forming sclerotioid masses before the complete development of the pericarp walls.

HOLBERT (J. R.), HOPPE (P. E.), & SMITH (A. L.). **Some factors affecting infection with and spread of Diplodia zeae in the host tissue.**—*Phytopathology*, xxv, 12, pp. 1113–1114, 1 graph, 1935.

Observations and experiments from 1931 to 1934 in Illinois and Wisconsin have shown that maize stalks damaged by bacterial leaf blight [*Aplanobacter stewarti*: *R.A.M.*, xv, p. 211], artificially defoliated, or infested by second-brood chinch bugs [*Blissus leucopterus*] are liable to more extensive and severe infection by *Diplodia zeae* than those not exposed to such injuries. The last-named pathogen is also more virulent on the stalks of plants allowed to fruit normally than on those in which grain-setting is purposely prevented, while it further prefers the tissues of plants exposed to either natural or artificial chilling and freezing temperatures during the approach to maturity. All these conditions may well involve a reduction in the carbohydrate reserves of the plants which enhances the susceptibility of the stalks (but not necessarily that of the ears) of maize to *D. zeae*.

JOHANN (HELEN). **Histology of the caryopsis of Yellow Dent Corn, with reference to resistance and susceptibility to kernel rots.**—*J. agric. Res.*, li, 10, pp. 855–883, 19 figs., 1935.

This is a detailed and fully illustrated account of the author's histological studies of the development from pollination to maturity of grains of strains of hand-pollinated yellow dent maize, in the attempt to determine anatomical differences which might account for the resistance or susceptibility of the strains to fungus diseases in general [cf. *R.A.M.*, xii, p. 159] and to *Diplodia zeae* [ibid., xv, p. 145] in particular. The only variations noted, which may have a bearing on the problem, were differences in the rapidity with which the hilar orifice is closed, in the thickness and compactness of the closing layer, and in the completeness of the union of the closing layer with the margins of the suberized membrane of the testa. Usually, a delayed and less effective closing of the hilar orifice was found in the strains which were known to be most susceptible in the field. Besides the closing layer being an effective barrier to the advance of the fungi through that region of the grain, it is possible that the process of its formation may be associated with chemical changes in the tissues, which afford a less favourable nutrient medium for the parasites. No anatomical features were observed sufficient in themselves to account for the reaction of various maize strains in the field. *D. zeae* infections were found in almost every case studied to begin at the proximal end

of the maize grain; in some strains the spongy tissues of the pedicel and proximal pericarp were filled with the fungus, while in others only a few straggling hyphae could be observed in these tissues.

Petri (L.). **'Deuterophoma tracheiphila' e malattie da virus degli Agrumi.** [*Deuterophoma tracheiphila* and virus diseases of Citrus.] —*R. C. Accad. Lincei*, xxi, 5, pp. 301–306, 1935.

Atanasoff's interpretation of 'mal secco' of lemon and other citrus trees as a virus disease [*R.A.M.*, xiv, p. 505], with *Deuterophoma tracheiphila* [ibid., xv, p. 213] as an insignificant concomitant, is disputed by the writer on a number of grounds: (1) the virulence of Trabut's infectious chlorosis of Algeria (with which 'mal secco' is identified by Atanasoff) to the sweet orange, whereas this host is uncongenial to the agent of 'mal secco'; (2) the weaker virulence of the graft-transmissible infectious chlorosis compared with that of 'mal secco'; (3) the uniform association of *D. tracheiphila* with the disease; (4) the non-transmissibility of the disease from the stock of a diseased tree to a healthy scion unless the former actually contains the fungus (though exceptionally 'mal secco' infection may proceed from the roots) [ibid., ix, p. 645]; (5) the inconspicuous symptoms shown by stocks of diseased trees cut near soil-level (which Atanasoff overlooked); (6) the rapidity of spread of the disease (3,000 hect. of lemon groves being destroyed in Messina and Catania since 1918, whereas if the disease had been introduced with the cultivation of the fruit little would be left to-day); (7) the absence of any foundation for the view that forcing for the early market predisposes to 'mal secco', since in Palestine and Greece forcing is not practised yet there is scarcely a lemon tree left in the island of Chios, while in the Peloponnesus and Crete the losses are enormous; and (8) the comparatively slow diffusion of a virus disease compared with one due to a fungus, such as that causing 'mal secco'.

Encouraging results are said to have been given in the control of the disease by the compulsory excision and destruction of diseased material —the sole means known at present of maintaining infection within reasonable limits and prolonging the life and productivity of the trees.

Carneiro (J. G.). **O tratamento das plantas citricas.** [The treatment of Citrus plantations.]—*Rev. citric.*, 7 pp., 6 pl., November, 1935.

Full directions are given for the treatment of citrus groves in San Paulo, Brazil, against a number of the more common diseases [*R.A.M.*, xiii, p. 693], supplemented by brief notes on their etiology and symptoms. Leprosis is one of the most serious diseases, and is characterized by the presence on the fruits of depressed, almost black lesions.

Nattrass (R. M.). **Prevention of wastage of Citrus fruit in transit.**—*Cyprus agric. J.*, xxx, 4, pp. 84–87, 1935.

Wastage of Cyprus oranges arriving in Europe is caused almost exclusively by blue and green moulds [*Penicillium italicum* and *P. digitatum*, respectively: *R.A.M.*, xiv, p. 742]; other fungi occur occasionally, but are unimportant, even *Diplodia natalensis* [ibid., xii, p. 506] not being found to any great extent, though present on some

of the trees in the older groves. Of the two moulds *P. digitatum* is the more serious.

Prevention of wastage resolves itself mainly into careful handling of the fruit at all stages in order to avoid minute injuries, and all workers handling oranges should be provided, if possible, with cotton gloves.

In preliminary disinfection tests oranges were dipped in 7 per cent. borax solution at 43° C. for 5 minutes [ibid., xv, p. 212], the same for ½ minute, cold saturated borax solution for ½ minute, and shirlan [cf. ibid., xiv, p. 9] 1 per cent. cold dip, a further lot remaining untreated as controls. The fruit was wrapped, boxed, and after transport by rail to Nicosia was stored for 24 days. Counts of rotted fruits showed that the treatments listed above gave, respectively, 8·5, 17, 2, 2, and 20 (control) per cent. infection. Shirlan gave good control, is simple to use, and does not cause excessive wilting, but it leaves a deposit, which must be rubbed off.

In a small trial in which oranges were wrapped in ordinary wrappers impregnated with iodine [ibid., xiv, p. 321], after 30 days' storage the wrapped fruits examined showed 0·6 per cent. wastage, as against 14 per cent. for the unwrapped controls; when storage had lasted 37 days the corresponding figures for the remaining fruit were 0 and 24 per cent. wastage, respectively. A further trial on a large scale on fruit exported to Europe is considered necessary to establish the value of the treatment.

BITANCOURT (A. A.). **Um protozoario parasita do Cafeéiro.** [A protozoon parasitic on Coffee.]—*Rev. Inst. Café*, x, 107, pp. 2486–2490, 1 fig., 1935.

In connexion with the development, in the coffee plantations of Parahyba and Pernambuco, Brazil, of a disease simulating phloem necrosis, associated in the former locality with an apparently new cochineal insect, *Cerococcus parahybensis*, and in the latter with *Rhizoecus coffeae*, the writer sums up and discusses Stahel's observations on this subject [*R.A.M.*, xiii, p. 367].

MÉTALNIKOV (S.) & MÉTALNIKOV (S. S.). **Utilisation des microbes dans la lutte contre les insectes nuisibles.** [The utilization of microbes in the campaign against noxious insects.]—*Ann. Inst. Pasteur*, lv, 6, pp. 709–760, 4 figs., 1 diag., 1935.

A detailed, tabulated account is given of the technique and results of the writers' comprehensive experiments in the control of a number of formidable agricultural insect pests by bacteriological methods, which have been found applicable, *inter alia*, to *Pyrausta nubilalis*, *Pieris brassicae*, *Galleria mellonella*, *Ephestia kuhniella*, *Lymantria dispar*, *Gelechia gossypiella*, *Bombyx mori*, and *Gryllotalpa vulgaris* [cf. *R.A.M.*, xiii, p. 766]. The method consists essentially in dusting the insects with a powder containing spores of the appropriate bacteria, which may also be made into an emulsion and sprayed on the plants liable to infestation. *Bacterium pyrenei*, a long, motile, Gram-positive, pink rod, also proved highly pathogenic to *Pyrausta nubilalis*.

Rietschel (P.). **Über zwei Parasiten von Tenebrio molitor.** [On two parasites of *Tenebrio molitor*].—*Arch. Protistenk.*, lxxxvi, 2, pp. 349–358, 5 figs., 1935.

Flour beetles (*Tenebrio molitor*) originating in south Germany and examined at the Frankfurt-am-Main Zoological Institute were found to be parasitized by a fungus, *Sporomyxa tenebrionis* n.sp., characterized by apparently amotile, amoeba-like vegetative stages with up to more than one hundred nuclei from which arise smooth-walled, oval spores, 10 by 6 μ. The organism occurs in the connective tissue, fat body, intestines, reproductive organs, and blood of the insects. The other parasite referred to in the title is a sporozoon.

Talice (R. V.). **Deux cas de sporotrichose produits par le Sporotrichum astéroïde de Splendore.** [Two cases of sporotrichosis caused by Splendore's asteroid *Sporotrichum*.]—*Ann. Parasit. hum. comp.*, xiii, 6, pp. 576–583, 1 fig., 1935.

The author gives a brief description of two cases of human sporotrichosis in Uruguay, the pus from the lesions of which was found to contain numerous asteroid bodies described in 1908 by Splendore in Brazil (*Ann. Igiene sperim.*, xx, p. 89, 1909) and provisionally ascribed by him to a new species, *Sporotrichum* (*Rhinocladium*) *asteroides*. The fungus isolated from the pus did not, however, reproduce these forms in culture, and neither were they observed in animals experimentally inoculated with the organism. Both human strains gave cultures indistinguishable from *R.* [*S.*] *beurmanni* [*R.A.M.*, xv, p. 221]. Since similar bodies have also been observed fairly generally in other human and animal diseases, the author considers that their presence in the pus is insufficient to warrant separation of the fungus as a distinct species and regards it as a variety of *R.* [*S.*] *beurmanni*. The origin of these bodies is still obscure.

Naegeli (O.). **Studien über die gegenseitige Beeinflussung von Pilzkulturen auf künstlichen Nährböden (Pilzkolonien als Nährböden für andere Mikroorganismen).** [Studies on the reciprocal influence of fungus cultures on artificial media (fungus colonies as nutrient substrata for other micro-organisms).]—*Schweiz. med. Wschr.*, lxv, 23, pp. 535–537, 4 figs., 1 col. pl., 1935.

Details are given of experiments with a number of human pathogens, e.g., *Microsporon ferrugineum*, *Hemispora rugosa* [*R.A.M.*, v, p. 363], *Sporotrichum gougeroti*, *S. beurmanni* [see preceding and next abstracts], and *Achorion schoenleini*, from which it appears that symbiosis, synergism, antagonism, and tropism may accompany the development of these organisms on artificial media. The three first-named, for instance, grew on the colonies of a pathogenic *Saccharomyces* on maltose and glucose agar, *Sporotrichum beurmanni* overgrew *A. schoenleini* and hindered its further development, while the last-named literally destroyed the colonies of an *Actinomyces*. The age of the cultures and the quantity and density of the medium are probably decisive factors in the development of these phenomena.

Sartory (A.), Sartory (R.), & Meyer (J.). **Étude de l'organisme isolé d'une arthrite sporotrichosique primaire avec métastase vertébrale.** [Study of the organism isolated from a primary sporotrichotic arthritis with vertebral metastasis.]—*C. R. Acad. Sci., Paris*, cci, 27, pp. 1501–1503, 1935.

From the pus of an arthritic lesion on the shoulder of an 18-year-old male, who four months later developed vertebral metastasis, the writers isolated a fungus forming radiating colonies with a crateriform, umbilical, blackish-brown centre and a smooth, whitish periphery. It produced septate hyphae with verticillate branches on the tips and along the sides of which were borne clusters of 4, 6, or 8 ovoid, sessile or shortly pedicellate, creamy-white, later darkening conidia, 4 to 8 by 2 to 4 μ; and after 48 hours spherical, oval, or cylindrical chlamydospores, 8 to 15 μ in diameter. Gelatine was liquefied and saccharose, maltose, and lactose fermented without gas production. A guinea-pig inoculated intraperitoneally with the organism developed at the site of injection a necrotic abscess, from which the fungus was recovered in an active form. Healing took place spontaneously.

The agent of the condition under observation is allied to *Sporotrichum schenckii* and *S. beurmanni* [see preceding abstracts], from which it differs, however, in the consistency of the colonies, the formation of verticillate branches bearing conidia, and the fermentation of saccharose and lactose; it is accordingly named *S. verticilloides* n.sp.

Williams (J. W.). **I. Effect of variation of ratios of dextrose to peptone on colonies of certain pathogenic fungi.**—*Arch. Derm. Syph., Chicago*, xxxii, 6, pp. 893–914, 1935.

The writer gives a very detailed account of the response of a number of fungi pathogenic to man to variations in the ratios of dextrose to peptone in the substratum [*R.A.M.*, xiv, p. 510]. The following media were used, all with 1·5 per cent. agar: Sabouraud's (S 4 consisting of 4 per cent. sugar and 1 per cent. peptone), the writer's routine medium (W 1, 4 per cent. peptone and 1 per cent. dextrose), M·5 (6 per cent. peptone and 0·5 per cent. dextrose), W·5 (4 per cent. peptone and 0·5 per cent. dextrose), and W·1 (4 per cent. peptone and 0·1 per cent. dextrose).

On the basis of macroscopic appearance only a rough but convenient classification of the fungi into seven groups is given.

Comparative abundance of growth and relative excellence of morphological differentiation were calculated by means of average indexes for S 4, W 1, and M·5. In respect of the former there was little difference between the three substrata, all of which were suitable; as regards the latter W 1 was superior. S 4 is particularly valuable as showing up pigments not otherwise developed.

Rosenthal (J. M.). **Blastomycosis in an infant six months old.**—*J. Lab. clin. Med.*, xx, 11, pp. 1164–1165, 1935.

The organism isolated from miliary epidermal abscesses in a six-months-old infant in Pennsylvania was a round, double-contoured,

budding, yeast-like cell, 10 to 12 μ in diameter, which was identified as *Cryptococcus gilchristi* [*Endomyces dermatitidis*: *R.A.M.*, xv, p. 154]. On glucose agar a white, flocculent (oidial) mycelium was formed in which were embedded spore-like elements, discernible under the action of a thionin stain. A complete recovery was effected by means of potassium iodide and X-ray applications.

De Monbreun (W. A.). **Experimental chronic cutaneous blastomycosis in monkeys: a study of the etiologic agent.**—*Arch. Derm. Syph., Chicago*, xxxi, 6, pp. 831–854, 9 figs., 1935.

From verrucose facial lesions of nine years' duration in a 68-year-old farmer the writer isolated a fungus characterized in infusion broth at P_H 7·2 by hyphae measuring 1·5 to 3 μ in width, round to oval conidia, 4·5 by 3 μ, sessile or borne on sterigmata 1 to 10 μ long, and intercalary and lateral, thick-walled, spherical chlamydospores, 8 to 15 μ in diameter, the germination of which in the tissues initiates the primary yeast-like phase of infection. The organism grew best at 25° C., but developed to some extent at 8° and from 28° to 38°; it produced neither acid nor gas in sugar-containing media but induced slight alkalinity in milk and slowly liquefied gelatine. The fungus was identified by Castellani with *Monosporium tulanense* [*R.A.M.*, xiii, p. 235]. It is cultivable either in the yeast-like form assumed in the lesions or as a mycelium.

Lesions typical of cutaneous blastomycosis in man were induced in three monkeys (*Macacus rhesus*) by means of subcutaneous and intradermal injections of cultures of the causal organism. In these animals, as in man, the disease tends to become systemic and chronic.

Gougerot (H.) & Lortat-Jacob (E.). **'Pityriasis versicolor' achromiant d'emblée, tardif, extensif, abortif, s'arrêtant, puis guérissant sans traitement.** [Pityriasis versicolor, achromatic from the onset, belated, extensive, abortive, becoming arrested, and healing without treatment.]—*Bull. Soc. franç. Derm. Syph., 1935*, 9, pp. 1795–1800, 1935.

Clinical details are given of three cases of achromatic pityriasis versicolor (*Malassezia furfur*) [*R.A.M.*, xiv, p. 169] developing as a belated sequel to sun-bathing (a fortnight or more after the last exposure) and assuming a considerable extension during the next 15 to 20 days, at the end of which further spread of the fungus is arrested and healing occurs spontaneously.

Baudet (E. A. R. F.). **Sur une dermatomycose du chien, à l'aspect de favus, produite par un Trichophyton à culture faviforme.** [Note on a favus-like dermatomycosis of the dog, caused by a *Trichophyton* with faviform cultures.]—*Ann. Parasit. hum. comp.*, xiii, 6, pp. 568–575, 2 pl., 1935.

From dermatomycotic material obtained from faviform lesions on a dog in Utrecht, the author isolated a fungus which formed on the media already used by him in similar work [*R.A.M.*, xii, p. 172] colonies typical of a faviform *Trichophyton*. These cultures remained sterile for several weeks but later developed a few aleuria. Secondary

cultures on beerwort agar showed aleuria, spindles, protoplasmic agglomerations, and dichotomous branching. On inoculation into healthy dogs and guinea-pigs the fungus produced crusted lesions containing both hyphae and spores. The fungus was recovered from these lesions and gave faviform cultures which when over 15 days old produced both aleuria and spindles. Favus of animals is attributed to *Microsporon*, but in this case whilst the lesion is that of favus, the macroscopic aspect of the culture is that of a faviform *Trichophyton*, though the formation of aleuria and spindles brings the fungus close to *Microsporon*. These results are considered to be a further argument against the validity of the binomial *T. faviforme* [loc. cit.].

TALICE (R. V.). **Sur un cas de maduromycétome à grains rouges observé à Montevideo.** [On a case of red-grained madura-mycetoma observed in Montevideo.]—*Ann. Parasit. hum. comp.*, xiii, 6, pp. 584–590, 1 fig., 1935.

A very brief description is given of a fungus which was observed in fixed material obtained from a mycetoma on a Uruguayan adult in Montevideo, characterized by red grains containing voluminous and distinctly septate hyphae, 2 to 3 μ in diameter, producing numerous, thick-walled, terminal or intercalary, vacuolated bodies, of variable size, which may be interpreted as chlamydospores; sometimes they filled the centre of the grain while interstitial matter appeared to be very sparse. Morphologically the organism is typical of the genus *Madurella* [*R.A.M.*, xi, p. 242], but owing to the fact that the fungus studied by the author caused the formation of red grains in the lesions, while those due to *Madurella* are always brown or black, a new genus *Rubromadurella* is created for this fungus, for which the binomial *R. langeroni* is suggested [without Latin diagnosis for either genus or species].

MILOCHEVITCH (S.). **Une nouvelle espèce pathogène de Ctenomyces, Ctenomyces bossae n.sp.** [A new pathogenic species of *Ctenomyces*, *C. bossae* n.sp.]—*Ann. Parasit. hum. comp.*, xiii, 6, pp. 559–567, 3 pl., 1935.

The fungus described in this paper was isolated from ringworm lesions of the endothrix type on the lip, chin, and neck of a student in Jugo-Slavia; similar lesions were also produced by inoculation into the guinea-pig. On glucose media it formed green, circular, downy colonies, raised at the centre, surrounded by a broad white outer zone bearing less dense, longer, and more erect aerial hyphae, and then by a colourless halo, 2 to 3 mm. broad, consisting of densely crowded, unequal, and very fine rays. After 25 days the cultures were entirely green except at the periphery. On maltose media the characters were very similar, and on both pleomorphism developed very slowly. On wheat flour agar and other media the fungus formed abundant spores, either on *Acladium*-like structures or in racemes with perpendicular branches, large numbers of elongated multicellular spindles, long and typical spirals, coremia composed of long and fine hyphae, and finally thick, torulose hyphae with crosier-like ends. This richness of morphological forms, as well as cultural similarity to *C.* (*Trichophyton*) *persi-*

color [*R.A.M.*, xiv, p. 35], induce the author to refer it to the genus *Ctenomyces* [ibid., x, p. 243], but as it differs from the species mentioned in its green, diffusible pigment, its slow pleomorphism, its decided pathogenicity to the guinea-pig, its torulose hyphae, and abundant development of spindles, it is regarded as a new species and named *C. bossae* n.sp. [without a Latin diagnosis].

CIARROCCHI (L.). **Dermatomicosi da Scopulariopsis brevicaule.** [Dermatomycoses due to *Scopulariopsis brevicaulis*.]—*G. ital. Derm. Sif.*, lxxvi, 6, pp. 1409–1421, 1 pl., 1935.

While onychomycoses due to *Scopulariopsis brevicaulis* [*R.A.M.*, xv, p. 20] are relatively frequent, the records of dermatomycoses resulting from this cause are stated to be extremely scanty; hence particular interest is considered to attach to the present detailed account of a case signalized by erythemato-squamous lesions on the right forearm of a male patient treated by the writer in Rome. The fungus isolated from the affected area was identified by Langeron as *S. brevicaulis*, and its somewhat atypical behaviour in culture is not regarded as justifying the establishment of a distinct species. Animal inoculation experiments gave conclusive results on mice only.

MINET (J.) & BRIDOUX. **Broncho-pneumonie aiguë mortelle à Aspergillus fumigatus et Rhizomucor parasiticus.** [A fatal case of acute broncho-pneumonia due to *Aspergillus fumigatus* and *Rhizomucor parasiticus*.]—*Pr. méd.*, xliii (i), 25, p. 498, 1935.

A rapidly fatal case of acute broncho-pneumonia in a somewhat atypical form is recorded in a 35-year-old woman in the Lille district of France. From the sputum were isolated in the early stages *Aspergillus fumigatus* [*R.A.M.*, xv, pp. 19, 20, 222], *Rhizomucor* [*Rhizopus*] *parasiticus* [ibid., viii, p. 104], and a few staphylococci, while subsequent analysis yielded the first-named alone in a pure state. It is thought that *R. parasiticus* may have stimulated the *Aspergillus* to unwonted activity, its pathogenicity not being ordinarily of such an extreme type.

DESSY (G.) & CELLINA (M.). **Patogenesi dell' infezione sperimentale da Mucor pusillus.** [The pathogenesis of experimental infection by *Mucor pusillus*.]—*Boll. Ist. sieroter. Milano*, xiv, 9, pp. 861–879, 8 figs., 1935. [German summary.]

A detailed account is given of the writers' inoculation experiments with *Mucor pusillus* [*R.A.M.*, xiv, p. 511] on laboratory animals, from which it appears that the fungus is pathogenic to rabbits, guinea-pigs, pigeons, and white mice by intravenous injections, but not to white rats or dogs. The lungs, kidneys, liver, and spleen are the organs chiefly involved. All attempts at immunization of the animals were unsuccessful.

SHAW (F. W.). **An abridged key to the species of pathogenic fungi.**—*J. Lab. clin. Med.*, xxi, 3, pp. 243–257, 1935.

This key is intended for use as a companion to the author's 'Abridged key to the genera of human pathogenic fungi' published in

the same *Journal* in 1934. Synopses are given of most of the pathogenic species comprised in each genus, the more common saprophytic representatives of which are also listed.

Der beste Schwefelverdampfungsapparat. [The best sulphur vaporization apparatus.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 52, p. 630, 1935.

In response to a reader's inquiry concerning the best sulphur vaporization apparatus, three rose-growers declare themselves to be satisfied with Rupprecht's 'Sulfurator' [*R.A.M.*, xiv, p. 313], which in one case is reported to have controlled mildew [*Sphaerotheca pannosa*: ibid., xv, p. 202] to the extent of 95 per cent. The bellows action, however, is considered to call for some improvement. An area of 8,500 sq. m. can be covered by two men using the large 50 kg. apparatus in 1½ to 2 hours. For areas up to 2,500 sq. m. the medium-sized apparatus is recommended, whereas the small 'Sulfurator' has been found inadequate. Good results are reported by one correspondent with a sulphur vaporization apparatus supplied by R. v. d. Kammer, Dahmsdorf, Gr. Kreutz.

Takimoto (S.). **Bacterial plant diseases in Japan. I. A white rot of Hyacinth.**—*Ann. phytopath. Soc. Japan*, v, 2, pp. 145–149, 3 figs. 1935. [Japanese, with English summary.]

The agent of white rot of hyacinths [cf. *R.A.M.*, xiii, p. 99] in Japan is stated to be morphologically and physiologically identical with *Bacillus aroideae* [ibid., xiii, pp. 194, 274; xiv, p. 473], a plurivorous plant pathogen distinct from Wakker's yellow rot organism (*Pseudomonas hyacinthi*) [ibid., xiii, p. 207].

Lindquist (J. C.). **La 'quemadura' de las hojas de Narcisos y Junquillos (Stagonospora curtisii).** [Leaf scorch of Narcissus and Jonquils (*Stagonospora curtisii*).]—*Rev. argent. Agron.*, ii, 7, pp. 237–244, 4 figs., 1935.

The writer, following Creager and C. O. Smith, describes the symptoms, discusses the etiology, and briefly indicates measures for the control of *Stagonospora curtisii*, the agent of leaf scorch of *Narcissus pseudo-narcissus* and *N. tazetta* [*R.A.M.*, xiv, p. 448], which was observed in the Argentine in 1930 and again occurred in 1935 in a virulent form at La Plata. The pathogenicity of the fungus was demonstrated by inoculation experiments on the above-mentioned hosts.

Parsche (F.). **Über die Kalkchlorose der Lupine.** [On lime chlorosis of the Lupin.]—*Z. PflErnähr. Düng.*, A, xli, 5–6, pp. 282–312, 1935.

The writer's experiments [which are fully discussed and the resulting data tabulated] at Tetschen-Liebwerd [Czecho-Slovakia] showed that lime-induced chlorosis of lupins [*R.A.M.*, xiii, pp. 9, 33; cf. also xv, pp. 110, 227] is most severe on the yellow (*Lupinus*) [*luteus*] and least so on the perennial (*L. perennis*), the white (*L. albus*) and blue (*L. angustifolius*) being intermediate in their response.

Manganese being antagonistic to iron, the manganese content of the

seeds was analysed and found to be generally high, especially in *L. albus*. In the yellow lupin it was possible to induce, by excess applications of manganese, a form of chlorosis curable by means of iron, but the amounts of the former element present in the seed are not regarded as sufficient to explain the phenomenon under consideration. A study of the relevant American and Russian literature would appear to indicate that the ammonia accumulating in the diseased plants brings about an alkalinization of the tissue juices and thereby renders the iron ineffective. Weight was lent to this hypothesis by experiments in which the application to yellow lupin seedlings of top dressings of various ammonium salts induced typical chlorotic symptoms curable by treatment with iron.

NILSSON-LEISSNER (G.). **More new host species of the Clover stem rot (Sclerotinia trifoliorum).**—*Bot. Notiser, 1935*, 6, pp. 505–506, 1 fig., 1935.

The exceptionally mild winter of 1934–35 proved conducive to widespread activity on the part of *Sclerotinia trifoliorum* in the Svalöf district of Sweden, where not only all the commonly grown leguminous crops but a number of farm weeds and other plants were attacked [in addition to those previously mentioned: *R.A.M.*, xiv, p. 315], namely: *Trifolium filiforme*, *Senecio vulgaris*, *Sonchus asper*, *S. oleraceus*, *Taraxacum* sp., *Plantago lanceolata*, carrot, swede, *Capsella bursa-pastoris*, and 11 other weeds. Successful inoculation experiments have been carried out with apothecia of the fungus on *S. oleraceus*, *Senecio vulgaris*, and *Stellaria media*.

CARNE (W. M.). **Apple investigations in Tasmania: miscellaneous notes.**—*J. Coun. sci. industr. Res. Aust.*, viii, 3, pp. 223–224, 1935.

After referring to a report by N. E. Holmes, C. R. Furlong, and J. Barker in which it is stated that bruising was the main factor in determining the development of breakdown [*R.A.M.*, x, pp. 114, 116] in a consignment of Jonathan apples received in London from Australia in 1934, the author points out that bruising is always a potential stimulus to breakdown [see next abstracts] in this variety but is as a rule one of its least important causes in local cool-stored fruit. Breakdown following bruising is relatively slow in its onset, and when present is often masked by more rapidly developing forms of the disorder. In 1934 and 1935, when other breakdowns were comparatively rare in Tasmanian Jonathan apples, breakdown in experimental lots was practically confined to bruised fruit during and after cool storage for periods up to 18 weeks.

CARNE (W. M.) & MARTIN (D.). **Apple investigations in Tasmania: miscellaneous notes.**—*J. Coun. sci. industr. Res. Aust.*, viii, 4, pp. 271–276, 1935.

In experiments conducted in Tasmania, Sturmer, French Crab, and Jonathan apples in anti-scald oiled wrappers were stored in containers, the carbon dioxide content of which was allowed to reach pre-determined levels ranging from 1·8 to 24·5 per cent. and was then held there

by blowing in air daily. In 1934, the mean storage temperature was 34° F. and in 1935, 32°, and the storage periods were 10 and 8 weeks respectively.

The data obtained [which are tabulated and discussed] showed that of the three varieties French Crab was the most susceptible to brown heart [*R.A.M.*, xiv, pp. 592, 770] and alcoholic poisoning [loc. cit.], Jonathan showing no susceptibility to the latter. Liability to both conditions increased with increase in the carbon dioxide concentration. Slight injury from brown heart and still less from alcoholic poisoning occurred in French Crab at carbon dioxide concentrations of under 3 per cent., and in Sturmer at those under 6 per cent., but no injury was observed in Jonathan at concentrations under 8 per cent. Injury apparently increased with maturity at picking in French Crab and Jonathan, but not in Sturmer. Low temperature breakdown [see preceding and next abstracts] appeared only in Jonathan, and increased with maturity at picking, carbon dioxide concentration, and storage duration; it is thought that French Crab and Sturmer would probably behave similarly in years of higher susceptibility to breakdown.

Delay in ripening was progressively more marked at concentrations rising from over 1 to about 5 per cent. On the whole, the best results as regards ripening and freedom from injury were given by carbon dioxide concentrations of 2 to 3 per cent. In such a year as 1935 the most suitable carbon dioxide concentration for a mixed consignment of Tasmanian apples stored at 32° was apparently 2 per cent.

Some Apple disorders experienced in the storage of Apples.—*Tasm. J. Agric.*, vi, 4, pp. 145–149, 4 figs., 1935.

Brief, popular notes are given on the following non-parasitic storage disorders of apples in Tasmania, viz., Jonathan spot (which is seldom important in fruit exported overseas) [*R.A.M.*, x, p. 467; xii, p. 574], deep scald [ibid., xiv, p. 769], and sleepiness or breakdown of Jonathan apples in mainland Australian markets associated with radial water-core [ibid., xiv, p. 701 and next abstracts].

In an experiment with Huon Jonathan apples in 1935 it was found that with any individual tree the larger fruits were more susceptible to Jonathan spot than smaller ones, while the fruits from heavily cropping trees were more susceptible than those from lightly cropping ones. In another experiment apples placed in storage 3 weeks, 1 week, and immediately after picking developed subsequently nearly 50 per cent., 11 per cent., and a negligible amount of spotting, showing the importance of cooling the fruit to 40° F. or under within a few days of picking.

Susceptibility to radial water-core increases with maturity and size of the fruit, and the condition appears earlier and is more severe in lighter than in heavier crops. When water-core is present relatively high temperatures are followed by rapid breakdown. During storage much of the water-core originally present may disappear, but the fruit is liable to become soft, mealy, and prematurely over-ripe or it may turn brown. At the first sign of radial water-core the picking should be completed without delay, beginning with the lighter-cropped trees. The maximum proportion of apples showing water-core should not

exceed 5 per cent. in any consignment except when destined for immediate sale locally.

CARNE (W. M.) & MARTIN (D.). **Breakdown in Tasmanian Apples.**—*J. Coun. sci. industr. Res. Aust.*, viii, 4, pp. 265–270, 1935.

Investigations into non-parasitic wastage in Tasmanian apples conducted since 1928 showed that a number of the more important varieties are subject to low temperature breakdown [*R.A.M.*, xiv, p. 770 and preceding abstracts], liability to which varies in different seasons and is the main cause of the seasonal variation in average wastage.

In varieties subject to this disorder the presence of bitter pit [ibid., xiv, p. 639], which usually develops more rapidly at high than low temperatures, increases liability to low temperature breakdown.

A third important form of breakdown is that associated with water-core [see preceding and next abstracts]. The breakdown in Jonathan, King David, and French Crab apples from Tasmania which usually occurs in Australian mainland markets each year from about May is largely due to the presence of water-core when the fruit is picked.

Liability to all three conditions is greatest in fruits from the most lightly cropping trees, which ripen earliest and form a large part of the first consignments each season. This explains why 'over-ripeness' breakdown of Cox's Orange Pippin and Ribston Pippin is more common in early than in later shipments. With alternately bearing trees the 'on' crop is much less susceptible than the 'off' crop. Liability to low temperature breakdown is greatest in seasons of cool summers, the best years being those of relatively high mean January and February temperatures. Differences in liability to breakdown between trees of similar crop weight on different soils under similar climatic conditions are mainly due to the effect of the physical characters of the soils on the incidence of bitter pit. As a rule the better soils produce fruit of better keeping quality than do poorer soils.

Varieties very susceptible to low temperature breakdown should not be stored at temperatures as low as 32° to 34° F.; in seasons with cool summers 38° is the minimum safe temperature unless the fruit is picked very early. Cox's Orange Pippin and Ribston Pippin are very susceptible, Jonathan, Scarlet, Sturmer, and French Crab susceptible, and Worcester Pearmain, Democrat, and Crofton resistant. Cleopatra is resistant unless pitted and Delicious unless severely water-cored. Resistant varieties have a relatively low level of titratable acidity and a low soluble carbohydrate content. Relatively high acidity, high soluble carbohydrate content, and slow starch loss accompany susceptibility to all three types of breakdown. Such conditions occur in seasons when the January and February temperatures are below normal. During the last two seasons predictions of the relative incidence of breakdown, based on tests of representative samples of fruit before picking and a study of the climatic factors, have been made with considerable accuracy.

The paper concludes with recommendations for control based on the necessity for picking, storing, and shipping the fruit in relation to the varieties concerned, their susceptibility, the crops on individual trees,

and seasonal climatic conditions; susceptible varieties should be segregated in storage at suitable temperatures.

Gregory (J. H.). **Water-core in Apples.**—*Qd agric. J.*, xliv, 6, pp. 748–750, 1935.

Field observations have shown that apples not unduly affected with water-core [see preceding and next abstracts] grow out of the trouble in two or three weeks, but in experiments with harvested fruit [which are described] no improvement was obtained either by common storage or by cold storage at 34° to 35° F. Affected fruits should therefore be allowed to remain on the trees long enough for recovery to take place.

Tiller (L. W.). **Notes on the cold storage of the Cox's Orange Pippin, 1935.**—*N.Z. J. Sci. Tech.*, xvii, 3, pp. 536–540, 1935.

Cox's Orange Pippin apples picked from trees carrying very light crops at the Research Orchard, Nelson, New Zealand, were found to show very poor keeping quality even under favourable cold storage conditions. It is believed that an improvement in average export quality would result from the elimination of large-sized fruits from light-crop trees. Fruit suffering from water-core [see preceding abstracts] is extremely susceptible to internal breakdown in cold storage and by no means immune from this disturbance in ordinary air storage, so that the exclusion from export of Cox's affected by water-core is also very important. The disease occurs chiefly in the highly coloured 'Extra Fancy' grade fruit growing in exposed positions on the tree, while the 'Good' apples, largely drawn from well-shaded portions, are particularly subject to bitter pit. At cold storage temperatures fruit suffering from water-core is seldom affected by bitter pit, and vice versa. High flesh temperatures (up to 106° F.) have been recorded in exposed apples on the trees, this being apparently a contributory factor in the inducement of water-core. The incidence of pitting on the trees was not materially modified by continual heavy irrigation during the eight weeks preceding picking, and this practice further failed to reduce susceptibility to internal breakdown in cold-stored fruit from trees bearing fruit of a given size. Fruit from a lightly laden, irrigated tree showed much more severe bitter pit and correspondingly less water-core and breakdown than that from an irrigated tree bearing a heavy crop.

Hockey (J. F.). **Notes on scab control.**—*Rep. N.S. Fruit Grs' Ass.*, pp. 111–112, 1935.

During 1935 late infection of apple fruits by scab [*Venturia inaequalis*] was conspicuously absent from most varieties in Nova Scotia, though there were pronounced exceptions in some districts. The July application of Bordeaux mixture is the best and cheapest means of controlling late scab yet found, and is recommended as a follower to any spray schedule. After several years' trial the 60 per cent. iron sulphate mixture [*R.A.M.*, xiv, p. 495; xv, p. 159] is recommended for the pre- and post-blossom applications, this weaker mixture giving better-finished fruit than the full strength mixture and almost equally good scab control. Followed by Bordeaux mixture 3–10–100 as a July spray it gave excellent results commercially.

Fruit russeting was quite prevalent on apples in Nova Scotia in 1935, especially from Bordeaux sprays, which should be used for the first two and last applications only. During very hot weather sulphur sprays occasionally cause russeting and in 1935 some of the wettable sulphur did so soon after the calyx spray.

CROWELL (I. H.). **The Cedar Apple rust and its control.**—*Proc. nat.* [*U.S.*] *Shade Tree Conf.*, *1935*, pp. 80–83, [? 1935].

This account of the cedar apple rust (*Gymnosporangium juniperi-virginianae*) and its control in the United States is a short, popular version of papers already noticed from another source [*R.A.M.*, xiii, p. 780; xiv, p. 771].

KIVILAAN (A.). **Viljapuu-Seenväkh, Nectria galligena Bres., selle esinemisest Lõuna-Eestis ja tõrjest.** [The occurrence and prevention of Apple canker, *Nectria galligena* Bres., in southern Esthonia.]—*Bull. phytopath. Exp. Sta. Univ. Tartu* 32, 52 pp., 15 figs., 1 map, 1935. [English summary.]

The old-established apple canker caused by *Nectria galligena* [cf. *R.A.M.*, vii, p. 676; xiv, p. 338, 794] in Esthonia affects a large number of indigenous and foreign apple varieties, the latter including Alexander, Antonovka, Calvill, Winter Golden Pearmain, Beauty of Boskoop, Delicious, and Ontario, and is also found on pears [ibid., x, p. 253]. In the orchard it causes an apple rot with the formation of conidia and perithecia on the rotten fruit. The fungus developed well on oatmeal agar, and when inoculated through wounds in the bark (but not otherwise) it induced canker formation, even on such resistant varieties as Liivima Sibulôun and Leedu Pippin. Of the total number of apple trees in southern Esthonia, only 31·2 per cent. of those in country orchards are affected by canker as compared with 73·9 per cent. in the towns, where crowding is thought to favour the spread of infection.

N. cinnabarina [ibid., xiii, p. 732] occurs in a parasitic form on apple, plum, ash, elm [ibid., xiv, p. 665], *Ribes* [ibid., ix, p. 321], and various ornamentals in Esthonia; a list is given of all its known hosts in the country. Lime (*Tilia cordata*) and ash trees are liable to infection by *N. coccinea* [ibid., viii, p. 289; xii, p. 44; xiii, p. 732], while *Rhamnus frangula* has been found harbouring *N. punicea* [ibid., vii, p. 676].

ROBERTS (J. W.). **An Apple canker caused by Monochaetia mali.**—*Phytopathology*, xxv, 12, pp. 1116–1117, 1 fig., 1935.

Since 1910 the writer has occasionally observed an apple canker caused by *Monochaetia mali* [*R.A.M.*, xii, p. 396], and in 1911 he carried out successful inoculation experiments with the fungus, which enters through deep wounds, penetrates far into the wood, and subsequently attacks the resulting wound callus, producing numerous fruiting bodies. In 1934 the canker, which somewhat resembles that due to *Nectria galligena* [see preceding abstract], was found on apple by L. Pierce in Indiana.

SHERBAKOFF (C. D.) & MCCLINTOCK (J. A.). **Effect of crown gall, hairy root, and woolly aphids on Apple trees in the orchard.**—*Phytopathology*, xxv, 12, pp. 1099–1103, 1935.

The results [which are discussed and the statistical data tabulated] of an experiment, involving 1,200 apple trees of 13 varieties, to determine the relation of crown gall [*Bacterium tumefaciens*], hairy root [*Bact. rhizogenes*: *R.A.M.*, xv, pp. 82, 206], and woolly aphids [*Eriosoma lanigerum*] to the heavy losses occurring in Tennessee orchards indicated that after three seasons' growth 54·6 per cent. of the trees with heavy insect infestation at planting time (the spring of 1923) were killed, while the figures for large crown galls, extensive hairy root, and apparent soundness were 34·1, 18·6, and 4·9 per cent., respectively. Similar results were obtained with trees dug up in December, 1928. The planting of trees showing such defects is therefore clearly unsafe.

HURT (R. H.). **Spraying and dusting Peaches for brown rot control.**—*Amer. Fruit Gr.*, lv, 7, pp. 7, 13, 1 fig., 1935.

The writer has found that the best control of peach brown rot (*Sclerotinia cinerea*) [*S. fructicola*: *R.A.M.*, xv, p. 161] in Virginia is given by a pre-harvest treatment of the fruit either with flotation sulphur or a new pink sulphur blending into the colour of the fruit and applicable as a spray or dust. Any form of wettable sulphur used as a spray should be applied at a minimum of 400 lb. pressure and at the rate of 3 lb. of the dry form or 5 lb. of paste per 100 galls. solution. Very promising results are stated to have been obtained with specially installed dust chambers which were added to the packing equipment by a number of local growers in 1934.

BANFIELD (W. M.). **Studies in cellular pathology. I. Effects of cane gall bacteria upon gall tissue cells of the Black Raspberry.**—*Bot. Gaz.*, xcvii, 2, pp. 193–239, 1 pl., 1 fig., 1935.

In the investigations described in some detail in this paper the author showed that the bacteria causing cane gall of black raspberries (*Rubus occidentalis*), generally attributed to *Bacterium tumefaciens* but probably due to a distinct organism [*R.A.M.*, ix, p. 395], in the United States are found primarily between cell walls of infected tissue, whence in the form of zoogloeal strands they penetrate throughout the gall tissue by dissolving the middle lamellae of the cell walls. Numerous degenerating protoplasts may become filled with bacteria in certain areas of the gall tissue and the bacteria may also occur in cavities resulting from lysis of masses of protoplasts and the cell walls. In the early stages of gall formation, cells at a distance from the bacteria may divide repeatedly, until the morbid tissue thus formed is invaded intercellularly by the organism, when the process is repeated farther away in the tissue; eventually, however, cell division ceases, the whole gall is invaded intercellularly by the bacteria and begins to degenerate owing to the lytic effect of the organism on the host cells with which it is in direct contact; such cells succumb either to cytolysis or autolysis [cytological details of which are given], and their place is fully

occupied by compact masses of the bacteria. Superficial discharge of the bacteria from the gall was frequently observed through the intercellular spaces formerly occupied by zoogloea.

While the visible structure of the cytoplasm of healthy black raspberry cells, such as those of the root tip, is that of a polyphasic complex composed of a clear, structureless ground substance, containing dispersed spherical, rod-like or thread-like mitochondria, spherical fat globules, and larger starch-bearing plastids, that of the morbid cells may be granular, alveolar, reticular, or it may appear as various three-dimensional open net-work patterns. Some evidence was obtained by micro-dissection and attempted culture of the non-bacterial nature of rod-shaped bodies of bacterial proportion seen in living cells of gall tissue, and cytological methods for the differentiation of the bacteria from these bodies are indicated.

Ainsworth (G. C.). **Fig mosaic.**—*J. R. hort. Soc.*, lx, 12, pp. 532–533, 1 pl., 1935.

A White Ischia fig growing in a pot under glass at Cheshunt developed leaf symptoms resembling those of mosaic [*R.A.M.*, xiii, p. 356; xiv, p. 462]. Some of the leaves showed irregular, yellowish-green blotches, often with pale margins and up to half an inch or more across, distributed on the blade with little relation to the veins; others showed pale green spots or bands usually associated with the larger veins and often with narrow, reddish-brown margins. The coloured areas were quite superficial, and were inconspicuous on the lower leaf surface. Many leaves appeared to be normal, and the distribution of the mottled leaves was rather irregular. On any one twig as a rule all the leaves appeared to be healthy or most were diseased, but there were more branches with affected leaves on one side of the tree than on the other. The leaves were not noticeably deformed, and only a few of the fruits were spotted. Although there is no published record of fig mosaic in Great Britain the disease is fairly common in this country, where it has been known for at least twenty years. Stocks should never be propagated from affected trees.

Robinson (R. H.). **Sprays, their preparation and use.**—*Sta. Bull. Ore. agric. Exp. Sta.* 336, 30 pp., 1 fig., 1935.

In this bulletin the author outlines some reliable methods for the home-made preparation of insecticides and fungicides and emphasizes the precautions that must be taken to ensure the best results. General information is given regarding the physical and chemical properties of the different commercial products, accompanied by notes on their stability, compatibility with other sprays, and effectiveness. The paper concludes with a compatibility chart for the products in common use.

Pittman (H. A. J.). **Bordeaux mixture.**—*J. Dep. Agric. W. Aust.*, 2nd Ser., xii, 4, pp. 410–427, 7 figs., 1935.

After briefly referring to the discovery of Bordeaux mixture and listing the advantages and disadvantages attendant upon its use, the author gives detailed instructions for its preparation at home in large or small quantities. Directions are added for the incorporation of

suitable spreaders in the mixture and the preparation of Bordeaux paste.

Garbowski (L.). **Zasady a sposob prowadzenia rejestracji chorób roślin.** [Principles underlying the registration of plant diseases and their application.]—*Rocz. Ochr. Rośl.*, Cz. A (Choroby roślin), ii obejm. okres 1931–1933 r. [*Plant Prot. Yearb.*, Ser. A (Plant diseases), ii for the period 1931–1933 incl.], Bydgoszcz, pp. 395–405, 1935.

In this paper the author briefly explains, for the benefit of the various research workers of the Plant Protection and Agricultural Experiment Stations in Poland [see above, p. 279], the theoretical purposes of the survey of plant diseases now being carried out throughout the country, and gives directions regarding the manner in which local observations should be recorded and systematized before being submitted to the central authorities.

Brooks (F. T.). **Some aspects of plant pathology.**—*Rep. Brit. Ass.*, *1935*, pp. 169–188, 1935.

In this Presidential address to the botanical section of the British Association delivered at Norwich in 1935, the author surveys recent progress made in various branches of plant pathology, particularly those aspects of interest to general botanists, the topics dealt with including the epidemiology of the cereal rusts (*Puccinia* spp.), the relation of environment to disease, biologic races of fungi, the relation between host and parasite, the influence of one fungus on another in the establishment of disease, and functional disease.

Smith (K. M.) & Doncaster (J. P.). **The preparation of gradocol membranes and their application in the study of plant viruses.**—*Parasitology*, xxvii, 4, pp. 523–542, 6 figs., 1 graph, 1935.

In this paper, the first of a forthcoming series, a detailed account is given of the technique established after three years' study by the authors for the preparation of Elford's gradocol membranes [*R.A.M.*, xv, p. 168] and of their application to the study of plant viruses. The ether-alcohol collodion forming the basis of the membranes was the same as that used by Elford, and all the other reagents were prepared by Elford's method.

As the least trace of water affects the pore size of the membranes the reagents must be absolutely water-free. To avoid errors from ageing and evaporation the ether-alcohol collodion (Necol) is mixed immediately on arrival at the laboratory with equal parts by weight of acetone, the mixture being stored in dried, stoppered 1-l. bottles. The collodion N 8/40 (1:9) was made up in fairly large quantities, and to ensure homogeneity each freshly made lot of collodion solution used was shaken for at least two hours, after each addition of the reagents, on an electrically driven shaker.

Each cell used for evaporating the collodion solution was constructed of two square plates of optically ground plate glass, a circular hole being cut in one plate, which was then cemented on to the other. Two cells 40 and 20 cm. in diameter were used, the former yielding

30 to 35 and the latter 7 or 8 filtration disks. In order to secure uniformity of pore size, it is essential that the cell in which the membrane is poured should be perfectly level.

The chamber in which the membrane is poured is one of the most important factors in producing uniform membranes. That used measured 9 ft. high by 3 ft. square and had double cavity walls 2 in. thick made of Beaver board. The front opened outwards to a height of 6 ft. 6 in. All the pouring operations were effected through a small glass inspection window 3 ft. 6 in. from the ground. The heating units consisted of five candle lamps controlled by a mercury-toluol thermostat set at 22·5° C., a temperature maintained without more than half a degree variation. While the membrane was setting a paper or cardboard hood placed over the cell prevented air currents and controlled evaporation. At the end of the evaporation period the action of the solvents was stopped by flooding the cell with distilled water. The membrane was removed from the cell as soon as it had shrunk away from the edges, and if large was then cut up into quarters or punched into disks. The material was then washed for a further 14 days with two changes of distilled water daily. The disks were sterilized by steaming for two hours at 100° in an ordinary steamer, being placed in small glass vessels with well-fitting ground-glass stoppers.

The membranes are calibrated according to the average pore diameter calculated [by a method which is fully described] from the rate of flow of water and a determination of the water content of each grade of membrane.

A difficulty in the application of this technique lies in the nature of the plant extract in which the virus must be filtered. For purifying the plant-virus suspension MacClement's adaptation of Warburg's and Christian's method of purifying a water-soluble ferment was used [ibid., xiii, p. 760], the final result being a colourless, slightly opalescent fluid with a very low protein content. This filtered rapidly through even the more impermeable membranes with very little clogging.

Weak suspensions of virus give a different filtration end-point from strong suspensions and it is therefore necessary to obtain some idea of the titre before filtration. In comparative filtration tests with suspensions of the potato virus X in sand-and-pulp filtrates and suspensions purified by the CO_2 method, the virus in the former passed the membrane, whereas that in the purified suspension was left behind on the membrane, possibly owing to aggregation of the virus particles.

The rate of filtration of virus sap from tobacco plants differed markedly according to the P_H value of the sap. Virus suspensions at P_H 8·4 filtered at less than half the pressure and in a fraction of the time necessary for the same suspension at P_H 5·8 to 6·2. No evidence was obtained that changing the P_H value of a virus suspension enables the virus particles to pass a membrane of smaller average pore diameter.

Freisleben (R.). **Weitere Untersuchungen über die Mykotrophie der Ericaceen.** [Further investigations on mycotrophy in the Ericaceae.]—*Jb. wiss. Bot.*, lxxxii, 3, pp. 413–459, 7 figs., 1935.

A comprehensive, tabulated account is given of the writer's further

studies at the Halle Agricultural and Plant Breeding Institute on mycotrophy in the Ericaceae [*R.A.M.*, xiii, p. 255]. As with the species of *Vaccinium* previously used, a retardation of growth was observed in 21 species belonging to 13 genera in pure cultures on a peat-sand mixture compared with similar material inoculated with *M*[*ycelium*] *r*[*adicis*] *myrtilli* α. Among the plants thus affected were *Ledum palustre*, *Rhododendron* spp., *Kalmia latifolia*, *Vaccinium* spp., *Calluna vulgaris*, and *Erica* spp., whereas *Arbutus unedo* and *Arctostaphylos uva-ursi* grew equally well with or without mycorrhiza. The adverse effects of cultivation without an endophyte could in all cases be counteracted by the inoculation of the substratum with mycorrhiza or soil fungi (e.g., *Penicillium glaucum*). Mycorrhizal formation was further experimentally induced in most of the Ericaceae by inoculation with *M. r. myrtilli* α, but here again the two Arbuteae failed to respond, possibly because their natural symbionts are distinct from those of the other genera in the family.

In further experiments on other media, good growth was attained only by plants in the presence of symbiotic fungi, especially on peat. Less thrifty development occurred in infected cultures on sand (the reason for this being unknown), on peat inoculated with killed mycelium of *M. r. myrtilli* β, *M. r. uliginosi*, and *P. glaucum* [ibid., xiv, p. 247; xv, p. 243], in asymbiotic cultures on a mineral nutrient agar with or without sugar, and on agar or sand with a mineral nutrient solution supplemented by the ether-insoluble fraction of *Boletus edulis* or by the aqueous solution of an alcoholic extract of *M. r. uliginosi*, *P. glaucum*, and *B. edulis*. It appears probable that the organic compounds in peat and its extracts, peptone, malt extract, potato agar, and fungal extracts exert an adverse influence on the growth of the plants, and that the stimulatory action of the mycorrhizal fungi is due rather to their capacity for inactivation, destruction, or absorption of the retarding principle than to any direct assistance in the development of the host. It is concluded that in natural soils a similar significance for the Ericaceae attaches to the endophytes and soil fungi representing the components of peritrophic mycorrhiza [ibid., xiv, p. 247].

RAYNER (M. C[HEVELEY]). **Mycorrhizal associations in Scots Pine.**—*Forestry*, ix, 2, pp. 154–155, 1935.

A pseudomycorrhiza figured in an earlier paper by the author [*R.A.M.*, xiv, p. 410] was attributed to Hymenomycete mycorrhiza with a secondary association of a dark brown mycelium which was thought to be *Mycelium radicis atrovirens* [ibid., xii, p. 386], but is now referred to *M. r. nigrostrigosum* [ibid., xiv, p. 187]. In the Dorset area from which the material was collected hyphae of both fungi are common as secondary growths on the mantles of mycorrhiza of Scots pine [*Pinus sylvestris*], and those now believed to show secondary infection by *M. r. nigrostrigosum* were collected from trees showing growth degeneration. The last-named fungus also forms mycorrhiza on Scots pine on moorlands in the north of England, where material was also collected from a degenerating plantation.

Brown (A. M.). **A study of coalescing haploid pustules in Puccinia helianthi.**—*Phytopathology*, xxv, 12, pp. 1085–1090, 2 figs., 1935.

Details are given of an experiment conducted at Winnipeg, Canada, to determine the possibility of initiating the process of diploidization in *Puccinia helianthi* by hyphal fusions between two haploid mycelia of opposite sex [*R.A.M.*, xii, p. 318].

A total of 288 pairs of pustules was used, obtained by sowing sporidia from germinating teleutospores on sunflower seedlings [ibid., xv, p. 202] and selecting pairs of monosporidial pustules separated from each other by a distance of from 2 to 4 mm., a barrier of Eastman's Opaque No. 1 preparation being placed between the two pustules of each pair to prevent the spontaneous intermixture of the nectar. Of this number, 110 produced aecidia, which nearly always appeared and reached their full development in one component before starting in the other; they originated in the area nearest the line of fusion and thence spread to the remoter part of the leaf surface. It is apparent from these results that, when two heterothallic haploid pustules coalesce to form one compound, mycelial diploidization of the components can be effected without the intervention of pycnospores.

Werner (A. R.). **The role of bios in the biology of the fungi of the genus Fusarium.**—*C. R. Acad. Sci. URSS*, N.S., iv, 1–2, pp. 61–64, 1935.

The studies briefly reported in this paper were carried out with *Fusarium vasinfectum* (the causal organism of wilt of various cultivated plants), *F.* [*bulbigenum* var.] *niveum* [*R.A.M.*, xv, p. 276] (isolated from wilted melon and watermelon plants), and an unidentified *Fusarium* of the *elegans* section, which causes a black rot and mummification of the fruit of certain varieties of watermelon in Russia. In soil naturally heavily contaminated with *F.* [*b.* var.] *niveum*, mycelium of the fungus was shown to be abundant on the decaying plant material but not on the mineral portion of the soil freed from vegetable matter. Spores of the organism were entirely absent from the soil, and the fact that *F.* [*b.* var.] *niveum* spores introduced into air-dry soil rapidly decreased in numbers and finally disappeared in four days from soil moistened to about 70 per cent. of its water-holding capacity but not in the soil kept in air-dry condition, leads the author to consider that they were used as food by the protozoa (amoebae) and putrefactive bacteria present in the soil, which were frequently observed in close proximity to the spores. The spores of *F.* [*b.* var.] *niveum* and of the other two species were shown to be relatively rich in bios [ibid., xv, p. 170], and it is believed that their disappearance from soil is to be explained by their effect on the other organisms which are strongly activated by bios.

In pure culture the three fungi produced spores only in natural media containing bios, but not on synthetic media in the absence of it. In the author's view, the plant parasitic activity of these fungi is chiefly due to their physiological need of bios, which forces them to invade living tissues in their search for this principle; in other words, their virulence to plants is controlled by the bios content of the substratum.

Porter (J. M.). **The effect of phosphorescent and fluorescent minerals upon the growth of fungi in cultures.**—*Proc. Ind. Acad. Sci.*, xliv (*1934*), pp. 76–78, 1935.

The irradiation of certain fungi by the phosphorescent light from zinc sulphide or luminous paint, either from the inside or outside of the culture dishes, generally caused a temporary inhibition of growth and increased sporulation (e.g., in *Fusarium oxysporum*, *Helminthosporium inaequale* [*Curvularia inaequalis*: *R.A.M.*, xv, p. 245] and *Sclerotinia americana* [*S. fructicola*: ibid., xv, p. 161 and above, p. 304]). Luminous paint on the inside of the culture chamber lids retarded the germination of *Alternaria solani* spores to such an extent that none germinated in 24 hours and only 10 per cent. in 60. This substance, therefore, may possibly be of some use as a fungicide. No effect was exerted by certain other phosphorescent and fluorescent materials tested.

Costantin (J.). **L'enroulement de la variété de Pomme de terre Belle de Juillet.** [Leaf roll in the Belle de Juillet Potato variety.]—*C. R. Acad. Sci.*, *Paris*, cci, 23, pp. 1080–1083, 1935.

Details are given of the writer's attempts to cure leaf roll and mosaic in the Belle de Juillet (Juli) potato variety by transferring the plantings from the level or low elevations to a high altitude (1,400 m.) in the Pyrenees, the object being accomplished in two years in the case of the former and in four in that of the latter disease [cf. *R.A.M.*, xv, p. 172]. The variety in question is stated to suffer to the extent of 100 per cent. from leaf roll in low-lying situations. In this connexion attention is drawn to the remedial effect of high latitudes on potato mosaic, as shown by R. G. Newton's experiments in British Columbia [ibid., ii, p. 519].

Dykstra (T. P.). **A top-necrosis virus found in some apparently 'healthy' Potatoes.**—*Phytopathology*, xxv, 12, pp. 1115–1116, 1935.

Grafts from Earliest of All and Bliss Triumph potatoes affected with mild, crinkle, and leaf-rolling mosaic [*R.A.M.*, xv, p. 246] to healthy Arran Victory and President resulted in many cases in the development of top necrosis on the two latter varieties. A similar effect followed the grafting of 'healthy' Burbank and Earliest of All scions on President. It was evident that these symptoms could not be attributed to the X virus [ibid., xv, p. 172] (the latent mosaic of 'healthy' commercial potatoes), which produces in Arran Victory and President only a mosaic type of mottling without necrosis. In 1933 grafts supplied by R. N. Salaman from England of Up-to-Date, a symptomless carrier of virus B and usually accompanied by X, on Arran Victory and President also caused top necrosis. In order to determine whether the X virus is a necessary component of this disease, grafts of Up-to-Date were made on U.S.D.A. Seedling No. 41956, resistant to the virus in question [ibid., xii, p. 388], by which procedure the streak-producing B component of Up-to-Date is retained to the exclusion of X. Grafts of the infected seedling to Arran Victory produced typical top necrosis symptoms, while in the case of tomato the B virus was transferred

without noticeable effects, its presence being demonstrated by the grafting of infected tomatoes on Arran Victory and President, which resulted in top necrosis. No symptoms developed in Burbank, White Rose, Irish Cobbler, Earliest of All, and Bliss Triumph on which Up-to-Date was grafted, indicating that these varieties probably serve as symptomless carriers of virus B. The latter is believed, however, to be absent from certain other American varieties, the grafting of which on Arran Victory or President leads only to mottling without necrosis.

KAHO (H.). **Das Verhalten der Eiweissstoffe gesunder und abbaukranker Kartoffelknollen gegen Salze.** [The reaction of the albumins of healthy and degenerate Potato tubers to salts.]—*Bull. phytopath. Exp. Sta. Univ. Tartu* 31, 22 pp., 1935.

The writer discusses and tabulates the data resulting from his experiments in Esthonia on the response of the albumins dissolved in the cell sap of healthy and 'degenerate' (leaf roll, mosaic, and crinkle) potato tubers [*R.A.M.*, xiv, p. 785] to salting out with various mineral salts, e.g., those of potassium, sodium, calcium, magnesium, strontium, barium, and the alkali earths, and to heat. Both healthy and diseased material of the Väike verev, Reichskanzler, Early Rose, and Bravo varieties was used, together with sound Majestic, Imperator, Allerfrüheste Gelbe, and Maercker tubers for comparison. There was found to be no essential difference between the albumin of healthy and degenerate potatoes in respect of its reaction to the above-mentioned elements, except that in sound tubers it shows a higher degree of ionization and is thus somewhat more resistant to dehydration than the albumin of diseased stock.

RAYNAUD (R.). **Les ennemis de la Pomme de terre.** [Enemies of the Potato.]—*Vie agric. rur.*, xxiv, 50, pp. 379–381, 1935.

Both wart disease [*Synchytrium endobioticum*] and late blight (*Phytophthora infestans*) are stated to cause very heavy losses in the Vosges Mountains (France), and in addition to notes on their symptoms and control a list is given of varieties resistant to both diseases, viz., Belle de Fontenay, Eureka Extra Early, Hollande du Gâtinais, Juli, Dargill Early (somewhat susceptible to blight), Quarantaine violette, Rosa, and Rosafolia (reaction to *P. infestans* uncertain) [cf. *R.A.M.*, xv, p. 250].

HORI (M.). **Studies on the relation of Phytophthora infestans (Mont.) de Bary to resistant plants.**—*Ann. phytopath. Soc. Japan*, v, 3, pp. 225–244, 1935. [Japanese, with English summary.]

Phytophthora infestans was shown by inoculation experiments to be capable of penetrating the epidermal cells of nearly all the 80 test plants, entry being particularly easy in most of the Solanaceae, including resistant potato [see preceding abstract] and tomato varieties. These were the only two hosts on which the fungus was able to attain its full development, other plants reacting merely by the formation of small, sterile spots at most. In resistant potato varieties the invaded cells are destroyed more rapidly than in susceptible sorts, with the result that the organism cannot make any further growth. Premature

disorganization of the tissues also follows mass infection of susceptible varieties by the fungus. Slight growth may be made by *P. infestans* in young leaves of certain other Solanaceae (particularly *S. nigrum*, egg-plant, and *Salpichroa rhomboidea*) and in those of *Vicia unijuga*, while in most of the non-Solanaceous hosts penetration was soon followed by disorganization of the tissues.

Kuilman (L. W.). **Het onderzoek over de mentek-ziekte van de Rijstplant.** [The study on the 'mentek' disease of the Rice plant.] —*Landbouw*, xi, 3, pp. 77–113, 1935. [English summary.]

After summarizing the history of previous investigations during the past 70 years on the 'mentek' [root rot] disease of rice in the Dutch East Indies [*R.A.M.*, xiv, p. 743], the writer describes his studies in Java, beginning at the end of 1930, on the relation of the trouble to a series of complex soil changes known as 'reduction'.

When the Baok variety was grown in Zinzadze's solution without an additional supply of ammonium nitrate, symptoms closely resembling those of the root rot developed; 96 per cent. of the nitrogen originally present in the medium as ammonium nitrate was exhausted in six weeks. Both in the laboratory and in the field protein synthesis in the young leaves of plants deprived of nitrogen was found by extensive analyses to proceed at the expense of the protein reserves in the older foliage, which turned rusty and ultimately died. Nitrogen deficiency induced 'mentek' symptoms equally in resistant (Lati sail Assam and Brondol poetih) and susceptible (Baok and Temas) varieties, and no appreciable differences were detected between the nitrogen contents of the two groups. No evidence was forthcoming that the disease is due to a very strong reducing action of the soil or to manganese, iron, and nitrite ions liberated in such soils.

Abe (T.). **On the resistance of conidia of Piricularia oryzae to low temperatures.**—*Ann. phytopath. Soc. Japan*, v, 3, pp. 206–215, 1 diag., 1935. [Japanese, with English summary.]

The germinability of conidia of the rice blast fungus (*Piricularia oryzae*) [*R.A.M.*, xv, p. 225] maintained in a refrigerator under dry conditions at —4° to —6° C. gradually diminished, but 20 per cent. or more were found to survive 50 to 60 days' freezing, while 14 per cent. were still viable on the 81st day from the commencement of the test. In another trial 10 to 30 per cent. of the conidia exposed to a constant temperature of —10° survived until the 75th day. When conidia produced on artificial media were transferred to the refrigerator at —10° in a suspension, only 1 to 2 per cent. germinated after 24 to 25 days and none after 31, indicating that the resistance of these organs to low temperatures is greater under dry than under wet conditions. In a further experiment, frozen conidial suspensions after 24 hours' exposure to a temperature of —10° were kept for 1½ hours in three incubators at 16°, 28°, and 40°. Germination was most profuse at the lowest and least abundant at the highest temperature, showing that the frozen conidia are less liable to injury by slow thawing at a relatively low temperature than by rapid thawing at higher ones.

MUNDKUR (B. B.). **Parasitism of Sclerotium oryzae Catt.**—*Indian J. agric. Sci.* v, 3, pp. 393–414, 1935.

An account is given of cultural and inoculation experiments which were started in Pusa following the outbreak of a serious sclerotial disease of rice in 1930–31 in the Rajasahi and Dacca division of Bengal. The sclerotial material studied included collections from several localities in India and Burma, and also a culture sent in by Park from Ceylon (a chromogenic strain of *Sclerotium oryzae*) [*Leptosphaeria salvinii*: *R.A.M.*, xv, p. 114]; one forwarded by Tullis from the United States, originated from a mono-ascosporous culture of *L. salvinii* [ibid., xv, p. 47]; a non-chromogenic strain of (?) *S. oryzae* from Park in Ceylon; a culture labelled *S. sphaeroides* [ibid., xiii, p. 653] from Nakata in Japan; and one labelled *S. oryzae sativae* [ibid., xi, p. 801] from Hemmi in Japan; the last-named fungus did not resemble any of the Indian collections and has never as yet been recorded in India, for which reason the culture was destroyed. Apart from two other forms, the study of which is not yet completed, the cultures obtained from Indian and Burmese material were referred to *S. oryzae*, and on the media tested formed small, smooth sclerotia measuring from 156 to 600 μ in diameter (the mean diameters from 242 to 405 μ). Re-examination of Briosi's and Cavara's specimens of *S. oryzae* showed the measurements given by them of the sclerotia (160 to 180 μ) to have been inaccurate, the diameters found by Ashby and by the author ranging from 225 to 330 μ (mean 270 μ) and 208 to 339 μ (mean 262 μ), respectively. Cultures of the fungus which were sent to Tullis produced the conidial stage (*Helminthosporium sigmoideum*), and this stage was also obtained at Pusa by incubating agar from a culture in a moist chamber in diffuse light.

Two of the local isolates, the non-chromogenic strain of (?) *S. oryzae* from Ceylon, and *S. sphaeroides* from Japan proved in culture to belong to one species, differing from *S. oryzae* in its hyaline mycelium; its larger, rough sclerotia; its inability to change the colour of the substratum; and in the absence of smoky, lobed appressoria and chlamydospore-like structures. The name *S. sphaeroides* suggested by Nakata is not admissible as this binomial has already been used by Massa (1912) for another sclerotial fungus in Italy. Ashby, to whom the fungus was submitted for comparison, found that it agreed in several major respects with Matz's description of *Rhizoctonia microsclerotia* [cf. ibid., xiv, p. 416], and Dr. J. Matz found that two of the cultures sent to him contained unmistakably this fungus. The Indian, Burmese, Ceylon, and Japanese cultures are therefore identified as *R. microsclerotia*, to which an isolation from rice straw in the Philippines is also referred.

Pot and field infection experiments in Pusa and observations in various parts of India from 1932 to 1934, inclusive, showed conclusively that while both *S. oryzae* and *R. microsclerotia* attack living rice plants they do not produce any significant disease symptoms under normal conditions in that country.

In an appendix to this paper, the author states that a perusal of Park's and Bertus's papers on the sclerotial diseases of rice in Ceylon showed that the culture sent to him by Park, and considered in

the body of the paper to be a non-chromogenic strain of *S. oryzae*, was really their B strain of *R.* [*Corticium*] *solani* [ibid., xv, p. 114], which these studies have obviously shown to be *R. microsclerotia*. He further states that their A strain of *S. oryzae* [referred by Tullis to *H. s.* var. *irregulare*: ibid., xv, p. 47] differs from all other strains of this species, inasmuch as the sclerotia are not easily separable, and have a rather rough surface and much smaller size, in which respects it tallies perfectly with a culture received by him from Nakata under the name *S. microsphaeroides* Nakata, a name which might perhaps be more appropriate.

Stevenson (J. A.). **The South American leaf disease of Para Rubber invades Central America.**—*Plant Dis. Reptr*, xix, 20, p. 308, 1935. [Mimeographed.]

A specimen of *Hevea* rubber recently received from Costa Rica showed profuse and typical infection by both the conidial and pycnidial stages of *Dothidella ulei*, apparently not previously recorded from the country [*R.A.M.*, xi, p. 608].

Sabet (Y. S.). **A preliminary study of the Egyptian soil fungi.**—*Bull. Fac. Sci. Egypt. Univ.* 5, 29 pp., 4 figs., 1935.

Samples were removed from the surface (5 cm.) layers of twelve different soils, representing both the alluvial field and sandy garden types of the Nile Delta [cf. *R.A.M.*, xv, p. 256], and plated out on agar. A table is given showing the distribution in the various samples of the 73 organisms in 35 genera encountered. The loamy soils were found to contain a richer fungus flora than the sandy ones.

Among the species of most frequent occurrence were *Rhizopus nigricans*, *R. arrhizus*, *Absidia lichtheimi*, *Mucor circinelloides* [cf. ibid., xiv, p. 655], *Aspergillus terreus*, *A. nidulans*, *A. niger*, *Penicillium expansum*, *Fusarium orthoceras* [ibid., xiii, p. 593], *Gliocladium vermoeseni*, *Hormodendrum cladosporioides* [*Cladosporium herbarum*: ibid., xiii, p. 22], *Alternaria fasciculata* [ibid., iv, p. 61], and *A. geophila*. Other records of interest are *Cunninghamella echinulata*, *Monilia brunnea*, *Stemphylium macrosporoideum*, and three organisms determined by van Beyma (*Zbl. Bakt.*, Abt. 2, lxxxix, p. 236, 1933) as new species, viz., *Oospora egyptiaca*, *Penicillium egyptiacum*, and *Cryptomela acutispora*.

A study of the quantitative data indicates that the incidence of soil fungi in Egypt is on the whole lower than that recorded for Europe and America, due probably to the alkalinity of the Egyptian soils (lowest P_H 8·22).

Krueger (W. C.). **Electric uses in the greenhouse.**—*Agric. Engng, St Joseph, Mich.*, xvi, 12, pp. 475–478, 2 figs., 1935.

In connexion with a general survey of the greenhouse uses of electricity, the writer gives some further information on the installation of electric soil sterilization plants [*R.A.M.*, xv, p. 225].

Two methods of application are available. In the batch method, the soil is placed in a box, drum, or other container and heated by

means of conduction through resistance wires. In the so-called 'resistance' method the soil is heated by the passage through it of electric current. The former method involves handling the soil both before and after sterilization, thereby affording scope for reinfection, whereas the latter may be applied to the soil *in situ*, thus obviating further handling and possible contamination. Four means of applying the resistance system to soil pasteurization are in use, namely, (1) setting metal strip electrodes into the soil bed at appropriate intervals, connecting them alternately to the two poles of the electric supply, and applying the current; (2) placing the strips in a box, packing soil into it, and after treatment pushing the soil out of the bottom; (3) placing the soil on one electrode plate and pressing the other down on the soil layer; and (4) setting the requisite number of electrodes in an insulated plate unit held in a frame permitting vertical adjustment, which is then forced into the soil. This method, the only one of the four involving no handling of the electrodes themselves or the soil, is stated to have given excellent results during a year's trial at the New Jersey Agricultural Experiment Station. The estimated current requirements for ½ to 1 yd. units are 3 to 7 kw. and 2 to 5 kw., respectively, consumption being calculated at 20 to 40 kw. hrs. per cu. yd.

Burgess (A. H.). **Deterioration of Hops during storage: observations and preliminary experiments.**—*J. Inst. Brew.*, N.S., xxxii, 12, pp. 467–478, 1935.

A fully tabulated account is given of the writer's observations and experiments at the South-Eastern Agricultural College, Wye, Kent, on the deterioration of hops during storage, manifested by a reduction in the amount of α acid in the resins, usually accompanied by an increase in the β fraction. These changes have hitherto been attributed to enzymatic processes, but preliminary tests indicate that the moulds *Mucor spinescens*, *Penicillium expansum*, and *Aspergillus niger* are responsible. These organisms, isolated from deteriorating hops, were shown to be capable of effecting a rapid reduction of α acid. [This paper, read before a meeting of the Institute of Brewing Research Scheme in London on 14th October, 1935, was followed by discussion (pp. 479–481).]

Desai (S. V.). **Organisms associated with Sugarcane mosaic and their relation to the mosaic virus.**—*Indian J. agric. Sci.*, v, 3, pp. 367–386, 1935.

The author states that, by using methods very similar to those described by him in a recent communication on tomato mosaic [*R.A.M.*, xiii, p. 546], he obtained in cultures of mosaic sugar-cane juice *in vitro* after numerous serial transfers the development of a pleomorphic bacterium [the morphological and biochemical characters of which are described], the non-filterable and visible (bacterial) cyclostage of which was very brief (four days out of 100 of its complete life-cycle), but with a long and stable, filterable and invisible (virus) cyclostage. In view of the repeated failure of this organism in all its cyclostages to reproduce mosaic by inoculation into healthy sugar-cane,

comparative serological tests were carried out, the results of which suggested that the mosaic virus was the stable filterable cyclostage, while the bacterial stage was antigenically different from the other cyclostages, and also from the mosaic virus. It was also shown in a series of inoculation experiments that the mosaic virus was neutralized by its own anti-serum and also by that of the filterable form. The latter serum, as well as the anti-serum of the bacterial stage and anti-mosaic virus serum, when inoculated into healthy sugar-canes, failed to confer immunity to the plants from inoculation with the mosaic virus.

Desai (S. V.). **Stinking rot of Sugarcane.**—*Indian J. agric. Sci.*, v, 3, pp. 387–392, 1935.

An outbreak was observed in 1933 of a sudden and rapid wilt of sugar-cane of the Co. 300 and Co. 313 varieties at the Mushari Sugar-cane Research Station, associated with an actively developing light grey, wet, and very offensively smelling rot, progressing from the top downwards; most of the plants thus affected were found to be also attacked by top shoot borers [*Scirpophaga*] which, of themselves, very rarely kill the plants outright. In the early stages of the disease bacteria were detected, mostly in the intercellular spaces, in apparently healthy tissues far removed from the 'dead heart', but also intra-cellularly where the rot was already advanced; the vascular bundles were also invaded, but did not decay as the rest of the tissues. In the field the disease appeared to spread to adjoining stools which were quite healthy and did not show attack by the top shoot borers. Isolations from tissues below the rotted area yielded, among other micro-organisms, two types of bacteria, one of which formed white and the other bluish colonies on nutrient agar. Inoculated into sound canes through superficial wounds neither bacterium caused infection, but when introduced deeply into the tissues and under excessively moist conditions the bluish culture produced a restricted rot, but not the white. Inoculations with the bluish bacterium through the borer holes resulted in rapid infection of the tissues, while the white type remained inactive under these conditions; mixed cultures of the two types proved, however, to be much more virulent than the bluish type alone. Further experiments showed that the disintegrated tissue from rotting canes was also highly infective. In special tests the sugar-cane proved to be the only susceptible host plant, and particularly the varieties Co. 300 and 313. Prolonged cultivation on agar appeared to reduce the virulence of the organisms.

The pathogenic, bluish bacterium is a small, non-sporulating, non-capsule forming, Gram-negative, greenish-yellow fluorescent rod with one polar flagellum, and 1·2 to 2·2 by 0·6 to 1·2 μ; it liquifies gelatine, ferments glucose, saccharose, lactose, and glycerine without formation of gas, peptonizes but does not coagulate milk, nor reduce nitrates, does not form indol, and produces pectinase. A comparison of these characters with those of *Bacterium aptatum*, *Bact. marginale*, and *Bact. xanthochlorum* [shown in a table] suggests that the organism of the stinking rot of sugar-cane belongs to the group of *Bacillus pyocyaneus*, and is named *B. pyocyaneus saccharum* [*R.A.M.*, xv, p. 1].

De Sornay [P.]. **La Canne à Sucre. Plantation par boutures de têtes et dégénérescence de la variété.** [Sugar-cane. Planting with terminal slips and varietal degeneration.]—*Bull. Ass. Chim. Sucr.*, lii, 9–10, pp. 638–642, 1935. [English and German summaries.]

The writer sets forth and briefly discusses his reasons for disagreeing with Martin's opinion (expressed in the February issue of the above-mentioned periodical) that the sereh disease of sugar-cane [*R.A.M.*, xii, pp. 57, 77] is a result of reproduction by means of terminal slips instead of well-lignified cuttings from the body of the plant [see next abstract]. In Mauritius, Hawaii, Madagascar, and other sugar-producing countries, where the former method has been practised for a century or more, there has been a steady increase of yield especially with the improved agricultural technique of the last decade or two. On these and other grounds the theory that sereh disease is associated with degeneration in the sense of physiological exhaustion is unacceptable.

Martin (F.). **La dégénérescence de la Canne à Sucre.** [Sugar-cane degeneration.]—*Bull. Ass. Chim. Sucr.*, liii, 9–10, pp. 643–661, 1 graph, 1935. [English and German summaries.]

Replying to de Sornay's criticism of his view that the sereh disease of sugar-cane is due to reproduction by terminal slips [see preceding abstract], the writer points out, *inter alia*, that no pathogenic agent of sereh has been detected and the disease appears to be definitely non-infectious since it would otherwise have spread over the entire globe with the cuttings distributed from Java, where it has existed for over sixty years. Additional confirmation of the writer's hypothesis is considered to be afforded by the fact that the form of degeneration in question is of comparatively recent date and coincides with the growth of industrial cultivation, in furtherance of which the terminal slip method of reproduction was introduced.

North (D. S.). **The gumming disease of the Sugar-Cane, its dissemination and control.**—*Agric. Rep. Colon. Sug. Refg Co.* 10 (*tech.*), 149 pp., 2 col. pl., 7 figs., 1935.

This is a comprehensive account of the disease caused by *Bacterium vascularum* [*Bact. vasculorum*: *R.A.M.*, x, p. 121; xv, p. 203 and next abstract] based on the author's studies of it in Australia, especially in northern New South Wales. The view is accepted that the disease originated in tropical America, was taken in cuttings to Mauritius in 1869, from that island to a number of points in New South Wales and Queensland in the middle '70's, and from Australia to Fiji. The disease is at present restricted to Australia (not recorded in Fiji since 1913), Mauritius, South America (Brazil, Colombia), and some of the West Indian islands. Severe epidemics occurred in Australia in the middle '90's, but by replacing susceptible with resistant varieties, non-ratooning of susceptible varieties, and seed piece selection the disease had disappeared from a number of areas by 1915 and was at a low ebb elsewhere. The reintroduction of susceptible varieties brought about renewed epidemics between 1919 and 1925 [ibid., ii, p. 578; v, p. 386].

The yellowish leaf streaks on the expanded leaves spotted with reddish-brown dots and blotches, being usually the first symptoms to appear, are important for early diagnosis. The author's investigations, which are presented for the first time in full detail, have shown that the bacteria ooze out through wounds on the streaks of turgid diseased leaves after they are wetted by rain or dew and are carried by driving rain to wounds on the leaves of adjacent stools; the streaks appear two to four weeks later. The spines or teeth along the margins of the leaves are the main cause of the numerous minute wounds on the leaves; infection can occur only at fresh wounds, being rare at those over two days old. Puncturing and gnawing insects, of which a great number were tested, do not spread infection, but flies [ibid., ix, p. 203] may be a subordinate means of spread, being important, however, as a means of occasional long-distance transmission. Gumming is primarily a highly infectious leaf-streaking disease and may remain restricted to the leaves, being shed with them as they age; as no transmission occurs in dry weather the leaves developed then are free from the secondary streaks. Under any conditions which check growth, such as waterlogged soil, dry or cold weather, the bacteria may grow down the vascular bundles in the leaf sheaths and enter the stem, causing systemic infection. The vessels which are reddened, especially in the nodes, become filled with the yellow bacterial gum or slime which oozes out from the bundles at cuts. Cavities filled with gum occur in the young joints and the leaves wilt and wither. Gummed cane juice is difficult to clarify and evaporate, causing foaming, delays crystallization, and reduces factory returns. Typical streaks on the expanded leaves can be produced easily with pure cultures of the organism. The author's 'standard' method is to make 20 to 30 fine needle-pricks, closely grouped within a circle about 2 to 3 mm. in diameter, the pricking being done through a drop of the inoculum placed on the leaf. Excepting *Saccharum spontaneum* and Kassoer, all varieties give streaks, but they may be faint and short on some commercially immune kinds such as Uba and P.O.J. 2364 and 2878. Cuttings are also readily infected at the ends, even the commercially immune sorts except *S. spontaneum* showing some gumming.

Gum sometimes does not ooze readily from the cut surfaces of infected canes; a good method to induce it is to put small cuttings of a stalk as soon as possible after it has been cut from the stool into a covered vessel to prevent evaporation and to examine after a half-hour's 'sweating'. A most searching and very reliable test for gum in canes very lightly infected is to bury fairly long cuttings in damp sand or soil for four weeks in summer or six weeks in winter until small shoots and roots have sprouted freely; after cleaning and cutting off the discoloured ends the cuttings are halved and sweated. This method can be recommended for selecting healthy setts from a lightly infected crop for planting seed-beds in isolation.

The cultural characters of the normal type of *Bact. vasculorum* present in New South Wales are described in detail and also those of some 'variants'; the index number of the normal type is 5020–31105–1202; it is not believed that definite varieties of the organism exist [ibid., viii, p. 464].

A fully tabulated account is given of experiments with the hot-water treatment of cuttings. Treatment for two hours at 50° to 51° C. kills the bacteria in the sett; if the infection is very light, $1\frac{1}{4}$ hours at 50° to 51° C. may be sufficient to ensure healthy shoots; treated setts rot readily, and although the buds grow they frequently become established with difficulty, but make thrifty growth as soon as they have their own roots. Malabar (Yellow Caledonia, White Tanna) is notably resistant towards the hot-water treatment.

The control of the disease has proved more difficult in New South Wales than in the tropics owing to the two-year cropping system and the great variations in rainfall from year to year; a higher level of resistance in required and indirect losses have been considerable because the available resistant varieties have been inferior croppers. Malabar has, however, been a valuable aid owing to its marked ability to survive the critical period at the end of the first year and to grow away from the disease during the second year. H.Q. 5 has also been freely used for the same reason. Of recent years successful efforts have been made in both New South Wales and Queensland to raise new superior resistant seedlings with the aid of 'resistant trial plots' [ibid., xi, p. 541 and next abstract] employing an inoculated tolerant carrier such as Innes 131 (M. 131) in a fringe row and standard varieties of known resistance as controls. Newly raised seedlings as original seedling stools are now planted out direct into these trials with one inoculated fringe stool alongside each seedling; this test permits the rapid elimination of the more susceptible seedlings and the selection of those highly resistant; the moderately or doubtfully resistant are planted again in a confirmatory trial plot which may be of sufficient size to allow at the same time for selection for general cropping value. The canes in these plots are grown to maturity at about 14 months, no advantage accruing from continuing them longer.

The reaction of 3,297 new seedlings had been determined by 1934 in gum resistance trial plots and the group parentage results are fully tabulated. An outstanding feature is the high resistance transmitted by the Kassoer derivatives to 94 per cent. of their offspring, P.O.J. 2878 being definitely superior as a parent to P.O.J. 2364. The *S. robustum* parentage has not proved superior to that of the 'noble' canes (*S. officinarum*). The author believes that with the aid of the newer superior resistant varieties now available the disease will become extinct in Australia within a few years. The report concludes with a list of 82 references to the literature of the disease.

BELL (A. F.). **Report of the Division of Entomology and Pathology.**—*Thirty-fifth Rep. Bur. Sug. Exp. Stas Qd*, pp. 39–48, 1935.

This report for 1934–5 [cf. *R.A.M.*, xiv, p. 332] contains *inter alia* the following items of phytopathological interest. An insect-proof quarantine glass-house is now being used in Queensland for the reception of sugar-cane varieties from overseas. The danger attaching to the possible introduction of more virulent strains of diseases than the local ones is pointed out; some of the strains of mosaic present in the United States, for instance, differ from the Australian strain, and may include

strains capable of attacking local varieties at present considered as highly resistant.

It is believed that the small outbreak of leaf scald [*Bacterium albilineans*: loc. cit.] that occurred in the Bundaberg district has been stamped out, and in north Queensland, the position in the worst area, El Arish, has greatly improved. During the very hot, dry spell preceding the rains in 1935, a fair amount of scald was present in many fields of S.J. 4, but most of the diseased stools died out.

Gumming disease [*Bacterium vasculorum*: loc. cit. and preceding abstract] will apparently soon cease to be of importance in southern Queensland. The outbreak on S.J. 4 in the Mulgrave area was further investigated; the disease was found on 8 out of the 35 farms in the quarantine area and on one new one just outside it, and in all cases the diseased varieties were S.J. 4 or Clark's Seedling. A resistance trial was carried out, but owing to the dry summer the amount of spread was smaller than was desirable for the purpose of the experiment. Most of the canes appeared to be highly resistant.

Red stripe [*Bact. rubrilineans*: ibid., xiv, p. 793] was somewhat in evidence in scattered fields in southern Queensland, following late summer rains; when the disease appeared on new varieties some anxiety was felt, but the symptoms soon passed away without causing any damage.

Much attention was paid to the Fiji disease situation [ibid., xv, p. 53]; in the Maryborough district 33 out of 55 farms visited were found to be affected, in District No. 5 only 3 out of 92 farms, and in the Nambour-Maroochy district, 11 out of 88 farms. A varietal resistance trial confirmed the highly susceptible nature of the P.O.J. canes 2940, 2727, 2878, 2875, 2725, 2364, 2747, 2714, and the Uba derivatives. The resistance of P.O.J. 213 and 234 was confirmed, and Co. 290, which is being widely planted in southern Queensland, appears to be resistant.

Downy mildew [*Sclerospora sacchari*: ibid., xiv, p. 333] is mainly confined to the Lower Burdekin district where it occurs on B. 208, but it is also found scattered throughout the Mackay area. In a varietal resistance trial Badila, Korpi, and S.J. 7 showed on 30th January, 1935, no diseased stools out of 38, 25, and 32, respectively, while P.O.J. 2878 and 2722 on the same date showed 10 and 18 out of 33 and 28, respectively. Field plantings, however, indicated that S.J. 7 is susceptible. In a further resistance trial carried out in another locality the order of susceptibility was found to be much the same.

Chlorotic streak [fourth disease: ibid., xiv, pp. 332, 530] was again very evident to the north of Townsville and appears to be causing very considerable losses in low-lying, wet areas. It has been observed on most varieties, including D. 1135. In a number of small test plantings infection occurred chiefly in the spring and early summer in young cane growing in small depressions in the fields. The young ratoons from two yield trials the previous year showed nearly 100 per cent. chlorotic streak in plots from healthy plants.

Inspections of farms where dwarf disease [ibid., xiv, p. 333] had been reported showed that the disease was very scarce, partly because the susceptible P.O.J. 2714 has not been planted and partly because the year had been a dry one.

Among minor diseases, knife-cut [ibid., viii, p. 134] was relatively

severe in the Bundaberg area, where, as high winds were experienced in July, appreciable damage was done in some crops. Stem gall [ibid., xii, p. 328] and the clustered stool that is perhaps related to it were more prevalent than usual on P.O.J. canes.

NAOUMOFF (N. A.). & KIRYALOVA (Mme D. N.). О двух новых плесневых грибах: **Byssochlamys musticola и Spicaria taurica.** [On two new mould fungi: *Byssochlamys musticola* and *Spicaria taurica.*] —*Acta Inst. bot. Acad. Sci. URSS*, Ser. II (*Plantae Cryptogamae*) *1934*, 2, pp. 361–364, 2 pl., 1 fig., 1935. [French summary.]

The authors isolated a new species of *Byssochlamys* [*R.A.M.*, xiv, p. 775] from non-acid soy-bean silage must in the Caucasus and Ukraine, which they name *B. musticola* sp. nov. The spherical asci [which are figured as arising terminally on lateral branches of mycelium] contain 5 to 8 spores, 4·3 to 5·8 (to 10) by 3·6 (up to 7·5) μ; neither antheridia nor oogonia have been found. The conidial stage is named *Spicaria musticola* sp.nov., and is characterized by undifferentiated or sparsely branched conidiophores bearing ovoid conidia 5·8 to 6·5 by 3·6 to 4·3 μ in diameter, forming long chains. Latin diagnoses of the two species are appended. *S. taurica* from wine must is also described.

WOLLENWEBER (H. W.) & REINKING (O. A.). **Die Verbreitung der Fusarien in der Natur.** [The distribution of the *Fusaria* in nature.] —80 pp., 41 figs., Berlin, R. Friedländer und Sohn, 1935.

This is a convenient tabular arrangement of the data recorded in the writers' earlier monographs on the genus *Fusarium* [*R.A.M.*, xiv, p. 708] under the following headings: (1) the *Fusaria* and their related perfect stages with references to the figures of these fungi in 'Fusaria autographice delineata'; (2) the *Fusaria* classified in groups and subgroups with their related perfect stages; (3) the occurrence of the *Fusaria* on plants (including fungi), animal entities, and raw materials and products of the vegetable and animal kingdoms, as well as in the soil, air, and water, with a list of the hosts affected arranged under the fungus names; (4) a host index of the *Fusaria*, and (5) observations on genera of fungi other than *Fusarium* represented by species liable to confusion with the latter.

GADD (C. H.). **Diseases of the Tea bush. I. Diseases in general and fungi in particular.**—*Tea Quart.*, viii, 3, pp. 132–139, 1935.

In this introductory paper the author gives a general account in popular terms of plant diseases and fungi, reference being made to symbiosis, host resistance and susceptibility, and the effect of environmental factors upon parasitism.

MCKINNEY (H. H.). **Evidence of virus mutation in the common mosaic of Tobacco.**—*J. agric. Res.*, li, 11, pp. 951–981, 3 figs., 1 diag., 1935.

Following brief references to his previous communications on the yellow mosaic viruses which he found to be associated with common green mosaic of tobacco [*R.A.M.*, xv, p. 261], the author gives a comprehensive account of his studies of three, among others, of such viruses which he isolated from 23 collections of the common green mosaic from different parts of the world. All these collections produced

a few bright yellow or yellowish-green spots on every one of the tobacco plants (Havana No. 38 strain of Wisconsin-Havana Seed obtained from successive cuttings from a single plant), while three other viruses which induced a green mosaic distinctly different from the common type, did not develop the yellow mosaic spots. The three yellow mosaic viruses which were investigated are described in some detail under the designations of types A, B, and C, corresponding to types 2, 3, and 1, respectively, briefly described in a previous paper [ibid., x, p. 410]; after isolation and purification they were shown to be constantly associated with the same symptoms, and thus represent permanent departures from the established type, this being the essential criterion for mutation. Furthermore, the common green mosaic virus appears to have an inhibitive effect on the yellow viruses, since when yellow mosaic tobacco plants are inoculated with common green mosaic the symptoms of the latter alone increasingly develop on the newly formed leaves, while inoculation of common green mosaic plants with one of the yellow viruses causes no change in the symptoms of the hosts.

These results are considered to indicate that, in view of the mutable nature of certain plant viruses, it is possible that viruses may be eventually isolated which will have both a prophylactic and curative effect and yet will not survive indefinitely in an active form in the plant.

HIRAYAMA (S.) & YUASA (A.). **Cytological study of Tobacco mosaic, I.**—*Ann. phytopath. Soc. Japan*, v, 3, pp. 197–205, 21 figs., 1935. [Japanese, with English summary.]

All the tissues of mosaic Hatano tobacco examined by the writers were found to contain X bodies and other cell inclusions [*R.A.M.*, xiv, pp. 51, 799], which were specially prominent in all the leaf tissues, stems (with hairs), roots (excluding hairs, caps, and calyptrogens), and flowers (hairs, calyces, corollas, and anthers). These bodies were accompanied by striate material, raphides, crystalline plates, and amorphous structures, while the anther tissues further contained an abundance of calcium oxalate crystals, and those of the roots bipyramidic, rhombohedral, or hexahedral crystals.

Inoculations were made by rubbing the leaf surface with a cloth soaked in the expressed juice of diseased foliage. The X bodies and other cell inclusions developed in the leaf tissues in about a week, rather more rapidly in the roots. The formation of the X bodies was observed to be preceded by a thickening of the cytoplasm, chiefly near the nucleus, followed by the delimitation of the body, the granular substance of which contains vacuoles. The striate material, raphides, crystalline plates, and amorphous bodies are regarded as products of the cytoplasm.

SPENCER (E. L.). **Studies on frenching of Tobacco.**—*Phytopathology*, xxv, 12, pp. 1067–1084, 3 figs., 1935.

In pot experiments on a heavy, neutral or slightly alkaline field soil of high water-holding capacity, severe frenching [*R.A.M.*, xiii, p. 732] developed in *Nicotiana alata*, *N. langsdorffii*, *N. longiflora*, *N. rustica*, *N. sanderae*, *N. sylvestris*, and 16 varieties of *N. tabacum*, including Burley, Connecticut Seed Leaf, Little Orinoco, Maryland, and Turkish,

while twelve other species, among which were *N. acuminata*, *N. glauca*, *N. glutinosa*, *N. paniculata*, and *N. suaveolens* remained immune. The only other plants contracting the disease out of a further 26 tested were three Solanaceae, viz., Giant Empress petunia, *Datura stramonium*, and Bonny Best tomato.

In greenhouse experiments the disturbance was controlled by soil composting, the addition of peat, repeated applications of a nitrogenous fertilizer, and several treatments with either copper sulphate (1 per cent.), or aluminium sulphate (at the rate of 1 gm. per 4 in. pot). No pathogenic organism was found to be connected with the trouble, which could not be induced, moreover, by the withdrawal of the various elements regarded as essential to plant growth, none of the symptoms of nitrogen, phosphorus, potassium, calcium, magnesium, and sulphur deficiencies resembling those characteristic of frenching. The addition of iron, boron, and manganese to the soil failed to prevent the development of frenching or to bring about recovery of diseased plants. The condition developed, however, in plants grown in sand by the daily addition of an aqueous extract of field soil or by that of one part of field soil to 2,000 parts of sand. It also appeared in seedlings in sand to which tap water from a deep well was added, over a period of some months.

Inasmuch as frenching was controlled without the addition of both copper and aluminium, it does not appear to be due to a deficiency of either of these two elements. From the data here presented frenching would seem to originate, not in mineral deficiency, but in response to the influence of some toxic principle present only in certain soils and operative solely under definite environmental conditions.

BANU (C.). & CONSTANTINESCU (C.). **Paraziţii criptogamici în răsadniţele cu Tutun ale Institutului, in primăvară anului 1935.** [Cryptogamic parasites in Tobacco seed-beds at the Institute in the spring of the year 1935.]—*Bul. Cultiv. Ferment. Tutun.*, xxiv, 2, pp. 171–189, 4 figs., 1935. [French summary.]

Tobacco seedlings in manured beds at the Băneasa (Bucarest) Experimental Institute for Tobacco Cultivation and Fermentation were rapidly destroyed in the spring of 1935 by the joint attacks of *Pythium de Baryanum*, *Fusarium* sp., and *Olpidium nicotianae*, the first-named originating in the seed before germination and the others appearing at a later stage. In beds on straw *Rhizoctonia* caused a certain amount of damage but was of no great practical importance. Control measures should include seed [see next abstract] and soil disinfection, sparing irrigation, and wide spacing; the soil should be treated with formalin (1 in 100).

CONSTANTINESCU (C.). **Desinfectarea semânţelor de Tutun contra cryptogamelor şi mentinerea facultăţii germinative in legătura cu tratamentul aplicat.** [The disinfection of Tobacco seed against cryptogams and the retention of germinative capacity in relation to the treatment applied.]—*Bul. Cultiv. Ferment. Tutun.*, xxiv, 3, pp. 314–320, 1935. [French summary.]

The best results in the writer's experiments on the control of fungal

seedling infection in three Rumanian tobacco varieties [see preceding abstract] were given by seed treatment with ceresan and cusisa dusts [*R.A.M.*, xiv, p. 659; xv, p. 1] at the rates of 10 and 15 gm. per kg., respectively, the former being somewhat superior both as a disinfectant and in the absence of any deleterious effects on germination.

CHAMBERLAIN (E. E.) & TAYLOR (G. G.). **The occurrence of spotted-wilt on Tomatoes in New Zealand.**—*N.Z. J. Agric.*, lii, 1, pp. 9–17, 7 figs., 1936.

A serious tomato disease, known locally as 'stripe' or 'brown top' but considered to be identical with spotted wilt [*R.A.M.*, xv, p. 65] has been present for some years in the Hutt Valley, New Zealand, and in 1934–5 appeared also in the Manawatu district. The condition, which may cause total loss, has in the last two seasons affected every plant in some late-season crops in the Hutt Valley.

Leaf-rub inoculations of healthy tomato and tobacco plants with juice expressed from diseased plants gave positive results (51 out of 75, and 12 of 32 plants, respectively); where the disease was transmitted to tobacco the secondary symptoms were in all cases preceded by local lesions apparently identical with those of spotted wilt on tobacco. Evidence was also obtained that the virus lives only for a short time when removed from the living tissues.

ADAM (D. B.). **Leaf mould : a disease of glasshouse-grown Tomatoes.**—*J. Agric. S. Australia*, xxxix, pp. 600–604, 2 figs., 1935.

The author records the occurrence of tomato leaf mould (*Cladosporium fulvum*) [*R.A.M.*, xiv, pp. 610, 684] in South Australia and gives a popular account of the disease and its control.

BOYD (O. C.). **Overwintering of Phytophthora infestans in Tomato fields.**—*Plant Dis. Reptr*, xix, 20, pp. 310–311, 1935. [Mimeographed.]

Belief that the agent of late blight (*Phytophthora infestans*) in tomatoes overwinters in the field in Massachusetts has hitherto been based on purely circumstantial evidence [*R.A.M.*, xiv, p. 405]. In the early summer of 1935, 70 plants of local origin were set out at the experimental farm in the site occupied in the previous year by a row of infected plants (which were ploughed under), while another 70 were planted some 40 yards away. Exceptionally dry weather prevailed from mid-July to 1st September. Late blight was first observed on 23rd September in both the check (one infection focus) and inoculated rows (21 centres). A volunteer plant that had escaped from cultivation remained free from the disease, as also did the tomatoes in neighbouring home gardens and in an extensive variety planting within 200 yards of the test. It is concluded that *P. infestans* overwintered in the 1934 crop refuse and thence initiated primary infection in the 1935 planting on the same site.

FAJARDO (T. G.) & MENDOZA (J. M.). **Studies on the Sclerotium rolfsii Sacc. attacking Tomato, Peanuts, and other plants in the Philippines.**—*Philipp. J. Agric.*, vi, 4, pp. 387–424, 12 pl., 2 figs., 1935.

Eight isolations of *Sclerotium rolfsii* [*R.A.M.*, xiii, p. 99; xv, p. 194]

from various hosts in different parts of Luzon, Philippine Islands, were all found to be strongly pathogenic to most of the locally grown economic plants. In culture they fell into three groups, as shown by differences in growth rate, type of colony, time required for sclerotial formation, and number, size, and colour of the sclerotia. Isolations I to VI, from tomato, bean [*Phaseolus vulgaris*], groundnut, and pineapple were apparently identical and were the commonest strain found locally; they generally produced round to ovoid, light to dark brown sclerotia. Isolation VII, from groundnut, differed from Nos. I to VI in its slower growth and coarser mycelium; it produced a few large, ovoid to very irregularly shaped sclerotia at temperatures below 33° to 35° C., at which range Nos. I to VI produced sclerotia abundantly. Isolation VIII, from groundnut, produced sclerotia only exceptionally. In all three groups growth was obtained between 10° and 35°, the optimum being between 28° and 30°, the maximum slightly under 42°, and the minimum about 10°.

The sclerotia of the common strain germinated readily on the surface of moist soil. Burial 4 in. deep in moist soil or 2 in. deep in flooded soil did not materially affect their viability, but at 5 to 6 in. nearly all the sclerotia were dead after 45 to 60 days. Infection was obtained on susceptible plants when pieces of mycelium or sclerotia were placed on or 1 in. under the soil in proximity to them; infection was, however, delayed when the fungus was buried 2 in. deep, and did not occur when it was buried 3 in. deep or more. The mycelium died after 8 months' drying in the laboratory, though some of the sclerotia survived 12 months'. The mycelium was killed after three minutes' exposure to temperatures of 48° to 50°, and both the mycelium and the sclerotia succumbed to one minute's exposure at 60° to 62°. In tests of 25 tomato varieties, the Burpee, Greater Baltimore, Dwarf Stone, and Acme were the least affected.

Eleventh Annual Report of the Imperial Forestry Institute, University of Oxford, 1934–1935.—34 pp., 1935.

This report, which is on the same lines as those for previous years [cf. *R.A.M.*, xiv, p. 264], contains (pp. 15–16) the following items of phytopathological interest. About two hundred Japanese sweet chestnut (*Castanea crenata*) seedlings inoculated with various strains of *Phytophthora* isolated from the common sweet chestnut [*C. sativa*] and beech were markedly susceptible to all of them. An inspection of woods infected with these organisms indicated that dry weather had reduced their destructiveness. In spraying experiments against *Meria laricis* [ibid., xiii, p. 280] in 1935 sulsol [ibid., xiv, pp. 213, 560] at much weaker strengths than formerly used gave very good control. A visit to France by W. R. Day showed that the type of poplar canker found there [ibid., xiii, pp. 150, 480] is similar to that occurring in England [ibid., xiv, pp. 408, 478], and that in both countries certain kinds of poplars are particularly susceptible and others much more resistant; it is therefore apparent that the most important means of control lies in the selection of resistant species or varieties. Of the substances tested during the year against damping-off of nursery seedlings only hortosan A, a mercury compound, was of any value. Spraying

again proved successful in controlling birch leaf rust (*Melampsoridium betulinum*) [ibid., xiii, p. 334; xiv, p. 464], but the source of infection could not be traced. No great fluctuations in the incidence of elm disease [*Ceratostomella ulmi*] were observed.

Worthley (L. H.). **Status of Dutch Elm disease eradication.**—*Proc. nat.* [*U.S.*] *Shade Tree Conf.*, *1935*, pp. 111–122, 1935.

In this review of the present situation of the Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*) [*R.A.M.*, xv, p. 266 and next abstracts] in the United States, the author says that encouraging results have been obtained by the eradication campaign so far. With Manhattan as the centre of a circular area, in July, 1935, the number of known diseased trees per sq. mile ranged from 10 in the zone 10 to 15 miles from the centre to 0·004 in that 45 to 50 miles distant. The organization of the campaign is briefly outlined.

Filley (W. O.). **Dutch Elm disease situation in Connecticut, August, 1935.**—*Proc. nat.* [*U.S.*] *Shade Tree Conf.*, *1935*, pp. 143–145, 1935.

In Connecticut the Dutch elm disease [*Ceratostomella ulmi*: see preceding and next abstracts] situation is now distinctly more encouraging than it was at the end of 1934. A total of 113 trees have been found to be infected; and of the further 2,675 suspects rather over 50 more cases may be expected. There appears to be no evidence that any rapid spread is occurring.

Rankin (W. H.). **Dutch Elm disease—New York State.**—*Proc. nat.* [*U.S.*] *Shade Tree Conf.*, *1935*, pp. 138–143, 1935.

In reviewing the results obtained in New York State since March, 1934, when a two-years' eradication campaign against Dutch elm disease [*Ceratostomella ulmi*: see preceding and next abstracts] was initiated, the author points out that the number of diseased elms found in the State will probably not reach 2,000 for the year 1935, or slightly less than the number for 1934, though without eradication measures the number might have been expected to be about.9,000. There are strong indications that the rate of spread will be still further reduced and considerable hope afforded of establishing local control.

Collins (C. W.). **Insect vectors of the Dutch Elm disease caused by the fungus Ceratostomella ulmi (Schwarz) Buisman.**—*Proc. nat.* [*U.S.*] *Shade Tree Conf.*, *1935*, pp. 127–132, 1935.

In the course of laboratory and field experiments with *Scolytus multistriatus* and *Hylurgopinus rufipes* [see next abstracts] to obtain data as to their relative importance as vectors of *Ceratostomella ulmi*, 63 successful transmissions of the fungus were obtained with *S. multistriatus*, of which nine were direct, the beetles emerging from a diseased tree and carrying the inoculum to a healthy one on which they fed. On 24 occasions the fungus was isolated from egg galleries made by *H. rufipes*. Out of 19 adult individuals of *S. multistriatus* collected,

seven showed the presence of the fungus, as did one out of seven of *H. rufipes*. *S. multistriatus* transmits the disease by feeding in the crotches of twigs of healthy trees after emerging from diseased ones, and by boring into the trunks or larger branches of weakened trees to make egg galleries in the inner bark and sapwood. The fungus was also cultured from *Saperda tridentata* beetles that had fed on a diseased tree, from nymphs of the buffalo tree hopper *Ceresa bubalus* that had fed in the greenhouse on a diseased tree, and from a weevil (*Magdalis* sp.) found on a diseased tree in the field.

MAY (C.). **The Dutch Elm disease from the research standpoint.**—*Proc. nat.* [*U.S.*] *Shade Tree Conf.*, *1935*, pp. 122–127, 1935.

In this paper the author reviews the researches on the Dutch elm disease [*Ceratostomella ulmi*: see preceding abstract] in progress in the United States. Studies carried out by Mr. Smucker to ascertain the infection courts through which the disease organism enters the tree, indicated that infection can take place only through a wound in the bark. Apparently infections are more readily effected during the active part of the growing season than in the late summer; when inoculations were made during the latter period there was some extension of the fungus into the wood, but for the most part it remained localized near the point of inoculation. Infections occurred in both old and new injuries. Very few spores sufficed to cause infection when they were brought in contact with the water-conducting vessels. In general a high percentage of the inoculated trees became infected. Inoculations of injured and uninjured leaves gave negative results, but infections were secured when spores were placed on the bases of severed petioles. Injuries through the bark were readily found on most elms in the field. *C. ulmi* was isolated by Dr. Walter in collaboration with Mr. Moses from the smaller European elm bark beetle [*Scolytus multistriatus*], the native elm bark beetle [*Hylurgopinus rufipes*], the common elm borer [*Saperda tridentata*], the buffalo tree hopper [*Ceresa bubalus*], and the red elm bark weevil [*Magdalis armicollis*].

With regard to calculations of the date of infection based on the annual ring count, the author considers that the method is not altogether reliable as the fungus may possibly move from recent to older annual rings [*R.A.M.*, xv, p. 130]. The rate of spread varies considerably in different trees; some are discoloured throughout with only one or two rings affected, others have only a few branches discoloured, but in these several annual rings may be involved.

In experiments by Dr. Verrall on the treatment of stumps to prevent sprouting and at the same time kill the fungus in the stumps and roots copper sulphate has given so far the best results.

Dr. Walter has found that some strains of *C. ulmi* vary considerably in their cultural characters, while there are also several closely related organisms that may be confused with *C. ulmi*. On one occasion a *Graphium* isolated from a diseased elm so closely resembled the Dutch elm disease organism that very careful single-spore isolations were necessary before it could be shown that the tree was not affected by this disease.

McDaniel (E. I.). **A new significance concerning insects attacking Elm.** —*Quart. Bull. Mich. agric. Exp. Sta.*, xvii, 2, pp. 142–144, 4 figs., 1935.

A popular note is given on the life-histories and feeding habits of the elm bark beetles, *Scolytus scolytus*, *S. multistriatus*, and *Hylurgopinus rufipes* [*R.A.M.*, xv, p. 130 and preceding abstracts] with reference to their actual or potential importance as agents in the transmission of Dutch elm disease [*Ceratostomella ulmi*] in the United States [see preceding abstracts].

Boudru (M.). **La maladie de l'Orme en Belgique.** [The Elm disease in Belgium.]—*Bull. Soc. for. Belg.*, xlii, 12, pp. 508–522, 1935.

Dutch elm disease (*Ceratostomella ulmi*) [see preceding abstracts] first appeared in Belgium in 1919–20, when it was recorded from the north of the country, after which it rapidly spread southwards. At present in western and central Belgium the destructive effects of the disease are very pronounced, while in the south-east the progress, though continuous, is slower.

A study of the relationship between resistance and soil types gave indefinite results and the addition of lime and nitrate of lime to experimental elms inoculated with *C. ulmi* had no effect on the progress of the disease.

Absorption by the branches of standing elms indicated that malachite green [*R.A.M.*, xv, p. 244] 1 in 10,000 was toxic to the fungus and stimulated a vigorous reaction by the tree. Sunoxol and chinosol [loc. cit.] had no injurious effect when absorbed by the roots of young elms, whereas mercuric chloride, malachite green, and ethyl mercuric chloride (mostly 1 in 10,000) caused complete desiccation of the plants. It is concluded that while injections with suitable fungicides may prove satisfactory as a curative measure, the best means of prevention lies in the development of resistant varieties [ibid., xv, p. 125].

Servazzi (O.). **Contributi alla patologia dei Pioppi. III. La 'defogliazione primaverile' dei Pioppi.** [Contributions to the pathology of Poplars. III. 'Spring defoliation' of Poplars.]—*Difesa Piante*, xii, 5, pp. 162–173, 3 figs., 1935.

By far the most important disease of Canadian poplars (*Populus canadensis*) in Italy, and one which has become progressively worse during the last ten years, is the leaf fall caused by *Fusicladium radiosum* [*Venturia tremulae*: *R.A.M.*, xi, p. 136; xiii, p. 605]. The disease usually appears early in spring, the leaves and sometimes whole shoots turning progressively black from the tip, after which the former become wrinkled, shrivel up, and drop; under favourable weather conditions infection may result in complete defoliation, which progresses from the top of the tree downwards. In late-season attacks the blackening is confined to portions of the leaf blades.

Infection generally reaches its maximum intensity towards the middle of spring; it slows down as the weather becomes warmer and is arrested in summer but is resumed with the return of cool weather. Field observations indicate that the fungus requires for its develop-

ment temperatures between 10° and 25° C., and when optimum temperature conditions for the fungus coincide with the initial phase of leaf development total defoliation may rapidly set in. Atmospheric humidity also favours infection, which is most prevalent and severe in localities where humidity remains high for long periods.

Trees which have been affected for several years show a smaller girth than others and a comparison of fully grown leaves from diseased and healthy trees showed a reduction of assimilating surface of 62·4 per cent. due to the disease.

In Piedmont *P. nigra*, *P. tremula*, *P. nigra* var. *italica* Dur., and *P. alba* are seldom attacked, and then only very slightly. The forms of *P. canadensis*, *P. monilifera*, *P. carolinensis*, and *P. duhamelii* are virtually immune. English and Danish poplar varieties are resistant, while hybrids of *P. canadensis* × *P. carolinensis* and of *P. canadensis* × *P. nigra stella* are, apparently, completely immune.

VAN HOOK (J. M.) & BUSTEED (R. C.). **Anthracnose of Betula nigra.**—*Proc. Ind. Acad. Sci.*, xliv (*1934*), p. 81, 1 fig., 1935.

Birch (*Betula nigra*) trees were severely defoliated in 1932 and 1934 by *Gloeosporium betularum*, which produces a few evenly distributed subcircular spots, 2 to 3 mm. in diameter, brown with a paler centre and surrounded by a yellow zone on the upper leaf surface, lighter-coloured on the lower. The amphigenous, brown acervuli measure 200 to 650 μ and leave a cup-shaped scar on falling out. The obovate, rarely ovate, granular, irregularly guttulate spores measure 8 to 15 by 6 to 8 μ and in most cases taper to a point at the lower end.

JACKSON (L. W. R.). **A new disease of the Oriental Plane-tree (Platanus orientalis L.) prevalent in the Philadelphia area.**—*Proc. nat.* [*U.S.*] *Shade Tree Conf.*, *1935*, pp. 77–79, 1935.

This description of the fatal wilt disease associated with a *Ceratostomella* closely resembling *C. fimbriata* that attacks *Platanus orientalis* in Pennsylvania is an expanded version of a paper already noticed from another source [*R.A.M.*, xiv, p. 408].

LOHWAG (H.). **Über eine Ahornkrankheit.** [On a Maple disease.]—*Zbl. ges. Forstw.*, lxi, 12, pp. 306–315, 5 figs., 1935.

In May, 1935, the author observed a maple tree in the Vienna Botanical Garden showing almost complete defoliation and with the cortex peeling off, exposing the fungus *Poria obliqua* (to which von Höhnel attributed a similar disease: *Oesterr. bot. Z.*, *1907*, No. 5, 5 pp.) growing on the xylem. The affected area was of a dingy brown colour, except towards the upper part, where white thickened portions of the subiculum (hyphal bundles) arise at the periphery of the fruit body and appear in dried specimens as an erect, membranaceous edge (Fries's 'ambitus erectus cristatus': Hymen. europ., p. 570); they act as a lever and forcibly detach the cortex in irregular segments. The brownish-yellow, septate hyphae, 6 to 9 μ in diameter, were readily discernible in the medullary rays and vessels. The wood was affected by a white rot.

PRUTENSKY (D. I.). Грибные заболевания Грецкого Ореха. [Fungal diseases of the Walnut.]—*Советские Субтропики* [*Sovetsk. Subtrop.*], *1935*, 5, p. 112, 1935.

The author states that in the subtropical belt extending from the Volga (Kirghiz Republic) to Russian Central Asia (Tadjikistan) the walnut [*Juglans regia*] is severely attacked by various surface and heart rots, the most prevalent of which is caused by *Polyporus hispidus* [*R.A.M.*, xi, p. 475], while that caused by *Fomes fomentarius* [ibid., xiv, p. 62] is somewhat less frequent. This state of things is considered to be largely due to the local methods of harvesting the nuts, which result in heavy wounding of the trunk and limbs of the trees. In Tadjikistan the leaves of the walnuts also suffer severely from attacks by *Marssonia* [*Marssonina*] *juglandis* [*Gnomonia leptostyla*: ibid., xiv, p. 203] and a species of *Cylindrium*.

FINLAYSON (E. H.). **Report of the Director of Forestry, 1934–5 (fiscal year ended March 31, 1935.)**—Issued by Dep. of the Interior, Canada, 45 pp., 1935.

In further experimental operations against white pine blister rust [*Cronartium ribicola*: *R.A.M.*, xiv, p. 540 and next abstract] in the Petawawa Forest Experimental Area, Canada, in 1934, the cost of primary eradication of currants and gooseberries amounted to about 15 cents per acre. In five years' time re-eradication will probably be required, at a cost not exceeding 7·5 cents per acre. Initial protection for the white pine (*Pinus strobus*) in eastern Canada is estimated at $600,000 with a further $120,000 for preliminary survey work, training of workers, &c. This total expenditure would extend over eight years and would probably amount to about 20 cents per 1,000 ft. of timber cut.

Very promising results as regards cracking were given at the Forest Products Laboratory, Ottawa, by the creosote treatment of yellow birch (*Betula lutea*) railway sleepers in the green condition. Analysis of the heartwood of untreated railway sleepers made of jack pine [*Pinus banksiana*] and affected with red stain showed that *Trametes pini* and the unidentified fungus referred to as 'No. 2' [ibid., xiv, p. 484] were still alive but not extensively present [after the sleepers had been five years on the track].

Stored unbarked pulpwood showed 0·23, 49·72, and 44·34 per cent. of wood volume affected by staining [ibid., xiv, p. 729], incipient rot, and advanced rot, respectively. These figures indicate that great losses due to decay may occur in pulpwood during prolonged storage, especially in unbarked logs.

MIELKE (J. L.). **Dates of production of the different spore stages of Cronartium ribicola in the Pacific Northwest.**—*Phytopathology*, xxv, 12, pp. 1104–1108, 1 map, 1936.

Tables are presented showing the dates of aecidial and pycnidial development of *Cronartium ribicola* [*R.A.M.*, xiv, p. 727 and preceding abstract] on *Pinus monticola* (and in one or two instances on *P. albicaulis*) and of uredo and teleutospore formation on *Ribes* in British Columbia, Washington, and Oregon from 1922 to 1934, inclusive [ibid., xiii, p. 605]. One of the earliest times of aecidial inception was in the

spring of 1934, when these organs were observed in mid-March in British Columbia and in late February in the two above-mentioned States (and Idaho). The data here assembled are stated to have been of value in the analysis of the seasonal spread of the rust in the areas under observation.

HEDGCOCK (G. G.). **Notes on the occurrence of Tuberculina maxima on the aecia of Cronartium cerebrum.**—*Phytopathology*, xxv, 12, pp. 1117–1118, 1935.

Hubert has recently listed *Cronartium cerebrum* as a host of *Tuberculina maxima* [*R.A.M.*, xiv, p. 482], but only 7 out of 225 typical specimens of the rust in the collections of the Division of Forest Pathology, Bureau of Plant Industry, Washington, D.C., were found to be infected by this parasite (all on *Pinus virginiana* from Maryland, Virginia, and Pennsylvania). Evidently, therefore, the parasitization of *C. cerebrum* by *T. maxima* is so rare as to be negligible from an economic standpoint.

HEPTING (G. H.) & DAVIDSON (R. W.). **Some leaf and twig diseases of Hemlock in North Carolina.**—*Plant. Dis. Reptr*, xix, 20, pp. 308–309, 1935. [Mimeographed.]

Hemlocks (*Tsuga canadensis* and *T. caroliniana*) in nurseries, hedges, and forests were extensively attacked in western North Carolina in 1935 by *Melampsora farlowii*, causing a die-back of the new shoots, which curled over spirally or in the shape of a shepherd's crook; death occasionally ensued when the shoots were girdled at their junction with the stem. *Keithia tsugae*, not hitherto reported so far south, was detected on some dead leaves scattered among the healthy foliage of twig-blighted trees.

A fungus apparently identical with the *Rosellinia* described by A. H. Graves from the Southern Appalachians (*Phytopathology*, iv, p. 63, 1914) was found in profusion near Pisgah Forest causing severe defoliation of hemlocks in moist, shady positions. It is characterized by black, spherical to dome-shaped perithecia and powdery masses of conidia.

WILSON (M.). **Some observations on the decay of timber.**—*Trans. bot. Soc. Edinb.*, xxxi, 4, pp. 473–480, 1935.

In discussing the fungi associated with dry rot of timber the author states that *Merulius sylvester* [*R.A.M.*, x, p. 70; xiv, p. 68] was recently found, apparently for the first time in Great Britain, growing on a fallen branch of *Pinus laricio* in East Lothian. *Coniophora cerebella* [*C. puteana*: ibid., xiv, pp. 267, 268, 541; xv, p. 186] was detected on very damp flooring of a house in Edinburgh five months after construction had been completed. The boards showed the longitudinal cracking characteristic of the fungus as well as the superficial white mycelium and the thin brown strands. *C. puteana* was isolated from the affected wood. The hypothesis that basidiospores of *M. domesticus* [ibid., xiii, p. 341] cannot attack timber when it is perfectly sound, but may do so when it is infected with *C. puteana*, was not sustained in a case of dry rot in Edinburgh affecting the top story of an old house into which no new wood had been brought for several years and where no evidence of the presence of *C. puteana* was found.

Lenzites sepiaria [ibid., xiv, p. 484, 795], apparently not very common in Great Britain, was found in Edinburgh producing a serious decay of the joists in a building; the timber (*Pinus sylvestris*) showed a very characteristic brown rot and could be easily crumbled by the finger-nail. No fructifications were present, but cushion-like masses of dark brown mycelium had developed on the surface.

Lentinus lepideus [ibid., xv, p. 186] occurred in buildings in Edinburgh, developing under feeble illumination, and not infrequently on Scots pine railway sleepers, in which it produced decay of the heartwood. *L. adhaerens* was recorded on timber in coal mines in Fife; no pilei were produced, but much elongated branched stipes were formed, which were frequently forked, resembling antlers. At first whitish and tomentose, they gradually turned dark brown, and may attain a length of one foot. *Polystictus fibula* was isolated from the woodwork in the interior of a saloon motor-car.

Trametes serialis [ibid., xiv, p. 805], which does not appear to have been recorded hitherto on buildings in Great Britain, was found in Edinburgh in 1929 causing a serious decay of spruce joists supporting a concrete floor.

CUMMINS (J. E.) & DADSWELL (H. E.). **The selection, preservation, distribution, and identification of Australian pole timbers.**—*Pamphl. Coun. sci. industr. Res. Aust.* 55, 79 pp., 7 pl., 22 figs., 1 graph, 1935.

Following a statistical survey of the present practices of pole-users in Australia, where approximately 3,000,000 poles are in use, the authors discuss the causes of deterioration in pole timbers. The main agents of decay are [unspecified] wood-destroying fungi and moulds, which account for 80 per cent. of the loss from deterioration, though the moulds in themselves have little effect on durability. Heart rot due to various unspecified fungi very commonly occurs in pole timbers (especially *Eucalyptus*), but cultures showed that in most cases the fungus was dead.

In discussing the preservative treatment of poles the authors strongly emphasize the importance of proper conditioning before treatment. No commercial pressure-treatment plants are at present in use in Australia, so that few data are available regarding this process. With hot and cold bath (open-tank) treatment creosote or creosote and oil mixtures are mostly used, the most suitable range of temperature being about 190° to 200° F. for the hot, and 90° to 100° for the cold bath. After cooling, a further short hot bath can be given. With water preservatives the temperature should be about 200°, water being added to keep pace with evaporation. Steeping in cold preservatives is not recommended. A fairly common practice in Australia is to puddle preservatives at the rate of 0·5 to 1·5 galls. for each pole into the soil round the base, a method that appears to have definite value in retarding decay, though in areas of high rainfall the treatment was effective for only two years.

Green poles can be treated by the Boucherie process [*R.A.M.*, xiii, p. 667]; by the use of solid preservatives in the bottom of the hole and around the collar, tests of which indicated that this method is of

value only in comparatively wet localities; by the bandage method developed in Germany, which consists in wrapping a cloth bandage containing thanalith U [ibid., xiv, p. 484] round the pole at the time of setting, the wood becoming impregnated by diffusion; by the Cobra process [ibid., vii, p. 418]; and by the osmosis process [ibid., xiii, p. 342]. The method of boring holes in the pole and filling them with preservatives does not add materially to service life under Australian conditions, and setting in concrete is not recommended.

The treatment of partly decayed poles by stubbing, by resetting the tops, by the bandage and Cobra processes, and by oxyacetylene charring [ibid., xv, p. 132] is also discussed.

KAMESAM (S.). **Relative wood preservative efficiency of the tri- and pentavalent forms of arsenic.**—*Curr. Sci.*, iv, 6, pp. 409–410, 1935.

Test-pieces of wood of 12 different species measuring 24 by 2 by 2 in. were impregnated under identical pressure conditions in the cold with 1·5 and 2·5 per cent. aqueous solutions of arsenic oxide and arsenic pentoxide [*R.A.M.*, xiv, p. 337], allowed to air-dry, and then laid down in the antiseptic test-yard of the Forest Research Institute, Dehra Dun. After 42 months the pieces treated with the 2·5 per cent. solutions showed practically no difference as between the effects of the two compounds, 7 out of 12 pieces being destroyed in each case. One was moderately attacked by white ants and fungal infection, and the remainder showed slight fungal attack. The specimens treated with 1·5 per cent. arsenic pentoxide were in slightly better condition than those treated with 1·5 per cent. arsenious oxide, while the controls had all been destroyed. This result indicates that in spite of its greater tendency to leaching arsenic pentoxide is not inferior to arsenious oxide as a preservative against termites and fungi.

LIESE [J.], NOWAK [A.], PETERS [F.], RABANUS [A.], KRIEG [W.], & PFLUG [H.]. **Toximetrische Bestimmung von Holzkonservierungsmitteln.** [The toximetric determination of timber preservatives.] —*Angew. Bot.*, xvii, 6, pp. 484–488, 1935.

Replying to Breazzano's criticisms [*R.A.M.*, xiv, p. 3] of the methods officially adopted at the International Conference of Mycologists and Wood Preservation Technicians held in Berlin in June, 1930, for the toximetric determination of wood preservatives [ibid., xiv, p. 411; xv, p. 133], the writers deal first with the objection that the results obtained by means of this technique are based on the initial concentrations of the substances used for impregnation and not on those actually present in the wood. This suggestion is repudiated as quite unjustifiable. In fact, the official method expressly prescribes that the degree of absorption of the disinfectant shall be calculated by the amount of preservative (expressed in kg.) taken up per cu. m. of wood.

With regard to the objection based on the difficulty of securing uniformity of distribution of the preservative in the wood, it is stated that the Conference recognized the possibility that the substances might accumulate on the surface of the relatively thick blocks. With oily substances, however, this difficulty may be disregarded, the extent of movement being negligible, while in the case of water-soluble

preservatives, under the extremely moist conditions prevailing in the Kolle flasks, any inequalities of diffusion must be purely temporary.

Turning to the alleged difficulty of deciding, by means of the official technique, whether the fungus is developing at the expense of the wood or at that of the medium, the writers point out that, after the expiry of the period of contact between the fungus and the wood, the block is weighed and the exact amount of loss of substance thus established. Whereas in Breazzano's 'thin piece' method the consumption of wood by the organism is roughly and indirectly gauged by the relative luxuriance of hyphal growth, the official technique permits of an accurate analysis by weight of fungal activity during the experimental period.

STROHBINDER (M. F.) & DRIABINA (Mme M. M.). Опыт применения метода Конна-Холодного при микробиологическом исследовании овощей и плодов во время хранения. [An experiment on the use of the Conn-Cholodny method for the microbiological investigation of vegetables and fruit during storage.]—*Микробиол.* [*Microbiol.*], iv, 3, pp. 379–384, 2 pl., 1 diag., 1935. [English summary.]

The method originally devised by Cholodny and modified by Conn for the direct examination of soil microflora [*R.A.M.*, xv, p. 115] was successfully applied by the writers at the Engels Commercial Institute, Leningrad, to the investigation of the fungal and bacterial deterioration of stored vegetables and fruit. Among the organisms detected by this means were *Bacillus carotovorus*, and *Aspergillus glaucus* on carrots; *Monilia* [*Sclerotinia*] *fructigena* and *Phoma* on apples; and *S. fructigena* on pears.

CHU (H. T.). **Notes on the penetration phenomena and haustorium formation in Peronospora brassicae Gäum.**—*Ann. phytopath. Soc. Japan*, v, 2, pp. 150–157, 16 figs., 1935. [Japanese, with English summary.]

In inoculation experiments on eight kinds of crucifers with the conidia of *Peronospora brassicae* [*P. parasitica*: *R.A.M.*, xv, p. 188], the germ-tube was consistently observed to penetrate the epidermis through the boundary between two cells and not by way of the stomata [ibid., v, p. 643]. In a moist chamber at about 15° C. conidia placed on leaves germinate in four to six hours, appressoria are formed in twelve, and infection hyphae in 18 to 24 hours. Haustoria are developed by the infection hyphae in the epidermal cells as well as in those of the inner tissues. The typical symptoms of infection by *P. parasitica* begin to appear two days after inoculation at 15°, and a day or two later the formation of conidiophores and conidia is initiated.

The haustoria in turnip and radish roots are at first spherical to piriform, becoming cylindrical or clavate, often di- or trichotomously branched, the maximum dimensions of a unbranched haustorium in this situation being 108 by 25 μ compared with only 11 by 8 μ in the leaves, where they are usually spherical and bi- to trilobate, and 57 by 14 μ in the stem of *Brassica chinensis*, where they are cylindrical or clavate and sometimes dichotomous. Some haustoria are surrounded by a sheath of variable extent from a collar round the neck to a third or half the length of the organ itself; the few full-grown haustoria found completely enveloped in vigorous roots inoculated with the fungus are probably incapable of functioning.

ARKER (H.). **Erfahrungen mit Schädlingsbekämpfungsmassnahmen im Kohlenbau.** [Experimental observations on pest control measures in Cabbage cultivation.]—*Nachr. SchädBekämpf., Leverkusen,* x, 4, pp. 162–171, 6 figs., 1935. [English summary.]

In the extensive cabbage-growing area situated on a plateau 400 m. above sea-level in the Stuttgart district of Germany, the plants are attacked in the seed-bed by *Phoma oleracea* [*P. lingam*: *R.A.M.*, xiii, p. 203] and *Peronospora parasitica* [see preceding abstract], and during the growing period by *Plasmodiophora brassicae* and *Pseudomonas campestris* [ibid., xiv, p. 153]. The control of *Plasmodiophora brassicae* should be based on rational crop rotation, preferably with beets, and the sparing use of stable and liquid manure, for which lime, calcium cyanamide, basic slag, and potash should be substituted [ibid., x, p. 574], while it is also to some extent amenable to soil disinfection with 0·25 per cent. uspulun (500 l. per acre) at least a fortnight before sowing, this method being primarily used, however, against *Phoma lingam*; for cold frames an application of 0·1 per cent. solution at the rate of 5 l. per sq. m. should be made before planting and one or two more after emergence. *Peronospora parasitica* chiefly attacks varieties with conical heads under glass and may usually be combated by ample ventilation and thinning out or transplanting.

Destructive Insect and Pest Acts, England. The Fruit Tree Pests (Essex) Order of 1935. Dated December 9, 1935.—4 pp., 1935.

As from 31st December, 1935, the Local Authority for the Administrative County of Essex, or the County Borough of East Ham, Southend-on-Sea, or West Ham, or the Borough of Colchester, Ilford, Leyton, or Walthamstow, as the case may be, is empowered to order the inspection and, if necessary, the treatment of gooseberry bushes against mildew (*Sphaerotheca mors-uvae*), apple trees against scab (*Venturia inaequalis*) and canker (*Nectria galligena*), pear trees against scab (*V. pirina*), and fruit trees in general against brown rots (*Sclerotinia* spp.) [*R.A.M.*, xv, p. 272].

Destructive Insect and Pest Acts, England. The Importation of Plants (Amendment) Order of 1935. Dated December 10, 1935.—2 pp., 1935.

The landing in England or Wales of any living plant of sugar beet or mangold from any country other than Scotland, Northern Ireland, the Irish Free State, the Isle of Man, or the Channel Islands is prohibited as from 1st February, 1936, except in accordance with the conditions of a licence issued by the Minister of Agriculture or an authorized inspector, with a view to preventing the introduction of virus diseases. [Similar regulations dated 6th January, 1936, are issued for Scotland.]

STRONG (L. A.). **Report of the Chief of the Bureau of Entomology and Plant Quarantine, 1935.**—96 pp., 1935.

The following items concerning the control of plant diseases occur in this report. From 1929 to 30th June, 1935, inclusive, 589,290 peach trees in thirteen States were found to be infected by the phony disease [*R.A.M.*, xiv, pp. 64, 374]; the 1935 inspections revealed the presence of the trouble in a total of 102,937 trees, the percentages of affected trees being 1·69 in commercial and 2·47 in home orchards.

During the fiscal year 1935 the citrus canker [*Pseudomonas citri*: ibid., xv, p. 64] eradication campaign was reorganized under the joint auspices of the Bureau of Plant Industry and the State officers of Louisiana and Texas. Between the beginning of January and the close of the fiscal year on 30th June, 1935, the disease was detected on 606 trees on 31 properties in the Galveston area of Texas. From July to December, 1934, the disease was located on 14 trees in three parishes of Louisiana. No infection has been reported in Florida since 1927.

During the calendar year 1934, 200,169,933 *Ribes* bushes were destroyed over an area of 3,358,209 acres in connexion with the campaign against white pine blister rust [*Cronartium ribicola*: ibid., xiv, pp. 220, 544, and above, p. 330]. That the rust is continuing to spread is shown by the constant discovery of fresh infections in unprotected areas both on pine and *Ribes*; the disease was observed on the former host during the year for the first time in Montana.

During the fiscal year 1934–5 over 570,000 barberry bushes in the north-central States were destroyed with a view to controlling the black stem rust of cereals (*Puccinia graminis*) [ibid., xiv, pp. 219, 672]. The uredo stage of the rust survived the winter of 1934–5 in considerable profusion on wheat in Texas, and, owing to the large acreage of late wheat in Kansas and Nebraska, the disease was much more prevalent than usual in those States in the following spring [ibid., xiv, p. 350]. Strong south winds on 23rd and 24th June carried infection into the spring wheat area, resulting in the most widespread epidemic of recent years.

Full particulars are also given of the progress to date of the Dutch elm disease (*Ceratostomella ulmi*) control work [see above, p. 326].

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Service and regulatory announcements July–September, 1935.—pp. 53–56, 64–65, 67, 1935.

Summaries are given of the plant quarantine import restrictions in the Colony of the Bahama Islands and the Republic of Haiti.

As from 4th July, 1935, the provision in the Uruguayan Decree of 10th January, 1934, requiring the certification of seed potatoes as specially selected material officially inspected and found free from 'degenerative' diseases [*R.A.M.*, xv, p. 248] is temporarily suspended.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, ix, 12, p. 277, 1935.

Colombia (Republic of). A Decree of 6th May, 1935, provides for the supervision by a special temporary commission of the areas on the Atlantic coast and the river ports of Magdalena with a view to preventing the import and export of material infected by injurious pests and diseases. As from 1st June, 1935, all products from disease-infested zones destined for export by the Pacific and River Magdalena routes must be accompanied by certificates vouching for the fact that the goods have been disinfected. The Inspector of 'Sanidad Vegetal', in his capacity as head of the said commission, will be empowered to adopt the necessary steps for the safeguarding of the interests involved.

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XV JUNE 1936

DECOUX (L.), VANDERWAEREN (J.), & ROLAND (G.). **La valeur de la désinfection des glomerules de Betteraves.** [The value of Beet seed-cluster disinfection.]—*Sucr. belge*, lv, 7, pp. 130–134; 8, pp. 145–152, 1935.

The results [which are fully described] of laboratory and field experiments in beet seed-cluster disinfection against black leg (*Phoma betae*, *Pythium de Baryanum*, and *Aphanomyces levis*) [*R.A.M.*, xv, p. 190], supplemented by a study of the relevant literature, indicate beneficial effects under local conditions from treatment of the I-Rimpau and II-Sandomiersko varieties with tutan or germisan, but owing to the relative unimportance of the disease in Belgium, the practical utility of the process is questionable.

SCHMIDT (E. W.). **Notizen zur angewandten Botanik. I. Über das Verhalten von verschiedenen Cercospora beticola Herkünften und über künstliche Infektion mit diesem Pilz.** [Notes on applied botany. I. On the behaviour of various collections of *Cercospora beticola* and on artificial infection by this fungus.]—*Angew. Bot.*, xvii, 6, pp. 445–453, 10 figs., 1935.

The ten strains of *Cercospora beticola* [*R.A.M.*, xv, pp. 191, 193] isolated from dried beet leaves in Germany (two strains), Austria, Italy, Holland, Hungary, Rumania, United States, Spain, and Japan, and grown in pure culture on a beet decoction-agar medium with 2 per cent. cane sugar, all produced the typical leaf-spot symptoms on the plants into which they were inoculated, and spore formation on the latter was normal in character and extent. There is thus no question of physiologic specialization within the species. In this connexion it is pointed out that the mycelial growth of the strains varies with the medium [ibid., vii, p. 694], of which the sugar-content particularly affected the colour of the colony, high sugar concentrations causing the formation of a bright red pigment. In addition to the species of *Chenopodium* already reported as susceptible to infection by *Cercospora beticola* [loc. cit.], *Amaranthus retroflexus*, *Atriplex hastata*, and *A. hortensis cupreata* contracted leaf spot as a result of inoculation. On the leaves of the last-named host, which normally appear deep red in consequence of their high anthocyanin content, the spots induced by *C. beticola* appear light green—probably an indication of a change in the reaction of the cell sap from acid to alkaline under the influence of the parasite.

DOERELL (E. G.). **Borax bzw. Borax-Superphosphat als Schutzmittel gegen Herz- und Trockenfäule der Rüben (Sommer 1935). Erfahrungen und Beobachtungen mit der Anwendung.** [Borax or borax-superphosphate as a prophylactic against heart and dry rot of Beets (summer 1935). Experiences and observations on its applications.]—*Dtsch. landw. Pr.*, lxii, 49, pp. 599–600, 1935.

The writer briefly summarizes the results of his observations in Czecho-Slovakia during the summer of 1935 on the control of heart and dry rot of beets [*R.A.M.*, xv, p. 189], from which it appears that the prophylactic value of borax is greatly enhanced by the simultaneous incorporation with the soil of superphosphate in a ratio of 1: 10 (20 kg. borax and 200 kg. superphosphate per hect.).

UPPAL (B. N.), PATEL (M. K.), & KAMAT (M. N.). **Pea powdery mildew in Bombay.**—*Bull. Dep. Agric. Bombay* 177 of *1935*, 12 pp., 3 pl., 7 figs., 4 graphs, 1935.

Pea powdery mildew (*Erysiphe polygoni*) [*R.A.M.*, xiii, p. 494; xiv, p. 287] often assumes epidemic proportions during January in Bombay Presidency where the conidial stage (the only one found) is generally seen as early as towards the end of November, and continues to spread until the advent of the hot season in April. The disease is very destructive in moist, warm weather, its most serious aspect being its attack on the flowers and pods. From November to January the maximum atmospheric temperature in Bombay generally ranges from 75° to 90° F., and it is during this period that infection reaches its maximum severity. As the daily temperature rises above 90° in March a set-back occurs in the development of the disease, which almost disappears in April and May.

In October, 1932, seed collected from diseased plants the year before was disinfected with mercuric chloride and sown in sterilized soil. Twenty days later 3 out of 5 plants showed the fungus on the leaves. In another similar experiment, out of 10 plants from the 1931 and 1932 seed 2 and 7, respectively, showed infection 45 days after sowing. This evidence suggests that *E. polygoni* is borne internally in the seed.

Twenty seeds from diseased plants were soaked in cold water for 6 hours and then exposed at 50° C. for 10 minutes. They were sown on 21st November, 1932, in pots, and on 3rd January, 1933, the first signs of mildew were noticed on control plants raised from untreated diseased seed, while the plants from the treated seed were still unaffected when the experiment was discontinued on 3rd February [ibid., vii, p. 70].

The weights of 307 healthy and heavily diseased seeds were, respectively, 66·8 and 21·1 gm. In two laboratory tests healthy seed gave 100 per cent. germination, while slightly and heavily diseased seed gave, respectively, 90 and 0 per cent.

One application of sulphur made during flowering gives complete control. The total dressing per acre need not exceed 25 lb., and the time required to dust this area amounts to about 2½ hours.

WALKER (J. C.). **A study of resistance to Fusarium wilt in Alaska Peas.**—*Amer. J. Bot.*, xxii, 10, pp. 849–857, 1935.

This is the full report of the author's investigation of the nature of

resistance to wilt (*Fusarium orthoceras* var. *pisi*) [*R.A.M.*, xiv, p. 148] in the resistant strain of the Alaska peas, an abstract from which has already been noticed from another source [ibid., xii, p. 412]. In addition to the information already supplied, the fact that the pea root rot fungus (*F. martii* var. *pisi*) [*F. solani* var. *martii* f. 2: ibid., xiv, p. 731], which is non-selective in its action, grew equally well on the extracts from fresh or dried roots of both the wilt-resistant and the wilt-susceptible strains of the Alaska pea suggests the existence in the wilt-resistant extract of some substance or substances inhibitive to the wilt fungus, possibly contributing to the resistance of that strain.

TASUGI (H.) & TAKATUZI (H.). **Nematosporangium aphanidermatum (Edson) Fitzpatrick on Phaseolus vulgaris L. in Nippon.**—*Ann. phytopath. Soc. Japan*, v, 3, pp. 245–264, 6 figs., 1935. [Japanese, with English summary.]

Beans (*Phaseolus vulgaris*) on a farm near Tokyo were found to be affected in 1930 by a cottony leak attributed to *Nematosporangium* [*Pythium*] *aphanidermatum* [*R.A.M.*, xiv, p. 498]. Good growth was made on a number of standard media, the most favourable being oatmeal agar, the temperature range for development extending from 10° to 40° C., with an optimum at 30°; mycelial production is most luxuriant at 20° to 24° and that of the oospores at 22° to 32°. The most suitable hydrogen-ion concentration for the development of *P. aphanidermatum* was found to be P_H 5·25 to 6·45, no growth occurring at 2·9. The pathogenicity of the fungus to bean pods, leaves, and seedlings was established by inoculation tests, in which it also infected the fruits of certain other Leguminosae, Solanaceae, Cucurbitaceae, and fig, as well as leaves and stems of the eggplant, *Datura fastuosa*, and various seedlings, the symptoms developing most freely at 27° to 34°.

HARRISON (A. L.). **Transmission of Bean mosaic.**—*Tech. Bull. N.Y. St. agric. Exp. Sta.* 236, 19 pp., 2 figs., 1 diag., 1935.

A brief tabulated account is given of laboratory and field experiments and observations in New York State from 1932 to 1934 to determine some of the factors that govern the transmission of bean (*Phaseolus vulgaris*) mosaic [*R.A.M.*, xv, p. 274 and next abstracts], the variety Stringless Green Pod Refugee being used exclusively in the controlled experiments. In the neighbourhood of Geneva, New York, bean mosaic has not been found so far to occur on other leguminous hosts, with the exception of one plant of white sweet clover (*Melilotus alba*). Of the other legume mosaics present in the State the viruses of the red clover (*Trifolium pratense*), alsike clover (*T. hybridum*), white sweet clover, and black medick (*Medicago lupulina*) mosaics were repeatedly transmitted to bean by the pea aphid (*Illinoia* [*Macrosiphum*] *pisi*) but with great difficulty by mechanical methods, the disease so produced being very similar to, if not identical with, yellow bean mosaic [ibid., xiii, p. 488]. None of the other legume mosaics was transmitted either by the aphid or by hand inoculation.

In a series of experiments it was shown that the considerable variations (ranging from less than 20 to as high as 59 per cent.) observed in the transmission of the bean mosaic through the seed is explicable by

the fact that pods formed early on infected plants transmit the mosaic to a larger proportion of their seed (43 to 100 per cent. during the first 19 days from the date of first flowering) than those set during the later period of blossoming (0 to 25 per cent.). The virus extract obtained from diseased seedlings and young plants was shown to be more infective than that of plants in the flowering or fruiting stages. Further, the mosaic was also transmitted when the leaves of mosaic-free and of diseased bean plants were roughly rubbed together by hand in insect-proof cages or by wind from an electrical fan in the greenhouse.

Field observations indicated that the spread of bean mosaic is greatly reduced in fields or plots freely exposed to the wind, and that it tends to spread much more rapidly in areas close to clover and lucerne than in those farther removed from such crops.

Harrison (A. L.). **The physiology of Bean mosaic.**—*Tech. Bull. N.Y. St. agric. Exp. Sta.*, 235, 48 pp., 4 figs., 6 graphs, 1935.

The experiments reported in this paper were carried out to determine the action of bean mosaic virus [see preceding and next abstracts] on the physiological activities of bean plants (Stringless Green Pod Refugee). It was first shown that exposure of mosaic-infected bean seeds to temperatures as high as 100° C. for several hours, to formaldehyde fumes for 16 days, and to the action of X-rays (from 1,000 to 32,000 R-units) failed to inactivate the virus or to eliminate the infected seeds. Attempts to differentiate healthy from mosaic-infected seeds by their specific gravity also failed to give significant results. The percentage of dry matter in the tops of mosaic bean plants, from the seedling to the blossoming stage, was, however, significantly lower than that in healthy plants, and the mosaic-diseased leaves transpired significantly less per unit of surface area and per gram of dry weight than the healthy.

Mosaic bean plants were found to produce a larger number of deformed flowers than the healthy, and their pods showed a tendency to be more curved and misshapen, and frequently were rough and oedematous. A water-soaked appearance of the pods was observed to be constantly associated with the mosaic under certain conditions; it was more severe on pods or plants that were infected just before or at the blossoming stage than on plants raised from infected seeds or infected in the seedling stage. On the average, the flowering of the latter plants was delayed by several days, while in plants infected during the flowering period, blossoming usually ceases for a period of several days, after which it is renewed. The ratio of the yield of pods to the dry weight is approximately the same in the mosaic and healthy plants, but the actual yield per plant is materially reduced on the mosaic plants, owing to the stunting effect of the virus.

The mosaic mottling was almost completely masked at both 15° and 30° C., and very distinct at both 20° and 25°. No rolling of the mosaic-infected leaves was observed at 15°, but increased in degree with a rise in temperature up to 30°, when the leaves of both mosaic and healthy bean plants were severely rolled up. The severity of mosaic symptoms was greater in strong light than in weak, but the length of daylight did not appear to exert any significant effect.

HARRISON (A. L.). **Mosaic of the Refugee Bean.**—*Bull. N.Y. St. agric. Exp. Sta.* 656, 19 pp., 7 figs., 1935.

Investigations have shown that in the New York State bean mosaic [see preceding abstracts] constantly reduces by 10 to 20 per cent. the yield of the popular French bean [*Phaseolus vulgaris*] variety Stringless Green Pod Refugee, which is mainly used for preservation in tins. Among other injurious effects on the crop, the mosaic also causes a delay in the flowering and podding periods, this leading to the necessity of more pickings to get smaller yields; furthermore, the pods from mosaic plants are darker in the tins than normal, probably because of their water-soaked condition while still on the plants. The symptoms of the disease are described in some detail.

While a measure of control may be obtained by sowing mosaic-free beans and roguing the diseased plants as soon as they appear in the field, the results are too uncertain to warrant recommendation. Some progress has been already attained at the Geneva Agricultural Experiment Station in the development of commercially desirable varieties resistant to mosaic by crossing the Stringless Green Pod Refugee with the mosaic-immune Robust variety, and back-crossing the hybrids thus obtained with the former; it is now, probably, only a question of time until these varieties are ready for commercial production. The disease may, however, be minimized until then by certain cultural methods, such as growing the beans on exposed fields isolated from other leguminous crops.

ASUYAMA (H.), NAGAI (Y.), & NISIKÔRI (T.). **A Helotium causing the black bulb disease of Allium bakeri Regel.**—*Ann. phytopath. Soc. Japan*, v, 3, pp. 216–224, 7 figs., 1935. [Japanese, with English summary.]

Field crops of *Allium bakeri* in Japan are subject to a black rot of the outer scales, which are reduced to a membranous consistency and permeated with a dense, dark-coloured mycelium giving rise, under moist conditions, to apothecia, with smooth stipes of variable length. The clavate asci measure 120 to 190 by 8 to 13 μ and contain eight uni- to bicellular spores, 13·3 to 19 by 5·7 to 6·7 μ. The fungus, which is believed to be a species of *Helotium*, grows well on agar media, producing on potato agar a white, floccose, aerial mycelium and a tough, blackish-brown thallus. After about four weeks black, stromatoid crusts are formed, from which arise the apothecia. A conidial stage was not observed. The optimum temperature for mycelial development is 20° to 25° C. The pathogenicity of the fungus was demonstrated by inoculation experiments.

[LABROUSSE (F.).] **La culture du Champignon de couche.** [Mushroom cultivation.]—52 pp., 6 pl., 19 figs., Bordeaux, Société Le Champion, 1935.

In this handbook directions are given for the commercial cultivation of mushrooms [*Psalliota campestris*], some of the chief points dealt with being the choice of a suitable place for the beds, the selection, preparation, and application of the manure, the method of gathering,

the maintenance of proper environmental conditions, and mushroom-growing in the open. A key is given for the identification of the pests and diseases attacking the crop based on the author's previous publication [*R.A.M.*, xiv, p. 213].

LEFEVRE (P.). **Quelques considérations sur la 'mosaïque du Manioc'.** [Some considerations on Cassava mosaic.]—*Bull. agric. Congo belge*, xxvi, 4, pp. 442–447, 3 figs., 1935.

Cassava mosaic [*R.A.M.*, xv, p. 203], first described in 1895 by Dammer from east Africa, is stated to be transmitted by diseased cuttings and by insects (*Bemisia gossypiperda* var. *mosaicivecta*) [ibid., xii, p. 137]. When the juice expressed from diseased plants was injected into the leaf parenchyma and sub-epidermal tissues of young shoots of healthy plants these all became diseased in a few days. Comparative manurial tests indicated that wood ashes had no effect on spread, while stable manure distinctly reduced it. Affected plants showed a definite reduction in yield. The bitter types of cassava appear to be more susceptible than the sweet ones, and exhibit symptoms of the disease as soon as the young leaves are formed. It is hoped to develop by selection strains which will remain unaffected under phytosanitary control.

FABRE (J. H.). **Sur les brûlures dues au soufre.** [On burns due to sulphur.]—*Progr. agric. vitic.*, civ, 52, pp. 615–616, 1935.

As applications of pure sulphur made to control vine *Oidium* [*Uncinula necator*: *R.A.M.*, xiv, pp. 75, 741] are liable in hot weather to cause scorching, many growers in north Africa give a first application of pure sublimed sulphur mixed by means of a shovel with an inert powder, usually sifted lime. As, however, the particles of the two constituents are seldom of the same fineness and density, and shovelling does not give a homogeneous mixture, the sulphur particles are badly spread on the vines, with the result that parts may be burned and others left unprotected. It is recommended that diluted sulphur prepared by the manufacturer should be used instead of the home-made product.

Reports on the work of Agricultural Research Institutes and on certain other agricultural investigations in the United Kingdom 1933–1934. —351 pp., H.M. Stationery Office, 1936.

This compilation, prepared on the same lines as that of the preceding year [*R.A.M.*, xiv, p. 422], comprises summaries of the work in progress at the various research stations, the laboratories of the Ministries of Agriculture for England and Northern Ireland, and the Department of Agriculture for Scotland, as well as the local investigations at advisory centres throughout the United Kingdom. Most of the phytopathological information presented in the report has already been noticed in this *Review* from other sources.

SMITH (F. E. V.). **Plant diseases. Report of the Government Microbiologist for 1934.**—*Rep. Dep. Agric. Jamaica, 1934*, pp. 23–24, 1935.

During the period under review the incidence of Panama disease of

bananas (*Fusarium oxysporum cubense*) [*R.A.M.*, xiv, p. 426; xv, pp. 105, 165] in parishes other than Portland amounted to 4,271 new cases and 149,907 recurrences (p. 22) as against 3,206 and 78,200, respectively, for 1933. At the time of writing the expedient of permitting one root treatment in St. Mary [ibid., xiv, p. 378] seemed to be fairly successful in maintaining a satisfactory level of production pending the development of an immune variety. It is stated on p. 2 of the report that the Cavendish banana [*Musa cavendishii*] was landed in England in a satisfactory condition in three small trial shipments in 1934. Promising results have been obtained on a small scale with the seedling S. 19, the fruit of which carries well.

A diminution in the intensity of the leaf disorder of coco-nuts previously reported from St. Mary [ibid., xiii, p. 79] was observed in consequence of better weather, but on the other hand bud rot [*Phytophthora palmivora*] [ibid., xv, p. 15] became abnormally prevalent. In the Montego Bay area a form of bud rot in which no fungal pathogen appears to be actively implicated has caused severe damage.

DEIGHTON (F. C.). **Mycological work.**—*Rep. Dep. Agric. S. Leone, 1934*, pp. 18–22, 1936.

In this report, the following items are of interest.

The continued severity of scab [*Sporotrichum citri*: *R.A.M.*, xiv, p. 428, and below, pp. 361, 362] on individual sour orange and rough lemon seedlings at Newton after long and careful treatment is attributed to individual susceptibility. Shading gave very beneficial effects in one test, only 11 per cent. of 463 sour orange seedlings under palm leaf shade developing scab, as compared with all of 401 seedlings in the open.

Early in July, 1934, psorosis [ibid., xiv, pp. 505, 627] appeared on late Valencia and Washington Navel oranges imported in 1925 from South Africa. The branch lesions were at first scraped, but fresh lesions broke out, and all the infected trees were burnt. On old, shrivelled grapefruits long kept in storage a dry rot of the bottom end was caused by an *Aspergillus* of the *A. wentii* [ibid., xii, p. 39] series. *Hypomyces ipomoeae* [ibid., xv, p. 100] was isolated from a grapefruit bruise rot and *Phytophthora parasitica* section *macrospora* Ashby from a rot of sweet lime.

Macrophomina phaseoli [ibid., xiv, p. 83] was occasionally present on the base of old stems of cowpea (*Vigna*) [*unguiculata*] and French beans [*Phaseolus vulgaris*]. Cowpea mosaic [ibid., ix, pp. 187, 666] was very common at Njala, this being the first certain record of the disease from Sierra Leone.

Rotting of the ripe fruit in bunches was common on oil palms [*Elaeis guineënsis*], especially on the Deli variety, at Njala in March and was present to a certain extent in April and May. *A Colletotrichum* [ibid., iii, p. 509; vii, p. 496] with cinnamon-brown spore masses was prevalent on the shrivelled fruit, *H. ipomoeae* and *Botryodiplodia theobromae* being occasionally present, apparently as secondary parasites. The disease occurs annually during the months mentioned.

The chief cause of rotting in ripe papaw fruits was *Glomerella cingulata*; other fungi which sometimes appeared to cause fruit rot of this host (*G. cingulata* always being present on another part of the same

fruit) were *C. capsici* [ibid., xiv, pp. 15, 344], *B. theobromae*, *Helminthosporium gigasporum* [ibid., i, p. 162], and a *Fusarium*; a species of *Phoma* was associated with stylar end rot.

Other records include *Cercospora canescens* [ibid., xiv, p. 87; xv, p. 60] on *Crotalaria juncea* and tomato, *C. canavaliae* on *Canavalia ensiformis*, *C. ipomoeae* on *Ipomoea purpurea*, *H. turcicum* [ibid., xv, p. 289] on *Sorghum margaritiferum*, *Ragnhildiana manihotis* on cassava [ibid., xiv, p. 396; xv, p. 59], and *Tryblidiella rufula* [ibid., xii, p. 791] var. *microspora* on dead twigs of lime.

Forty-fifth Annual Report for the fiscal year ended June 30, 1935.—*Bull. Wash. St. agric. Exp. Sta.* 325, 83 pp., 1935.

In the section of this report dealing with agronomy (pp. 13–22) it is stated by E. F. Gaines and A. M. Schlehuber that of 281 White Odessa × Turkey-Florence F_4 progeny tested for resistance to physiologic form Ft-4 of wheat bunt [*Tilletia caries*] the progeny from resistant F_3 rows in general produced resistant F_4 rows [*R.A.M.*, xiv, p. 286; xv, p. 287]. The F_4 rows showed from 0·2 to 91 per cent. infection in 1935, and an average for all rows of 6·7 per cent. less bunt in 1935 than in the F_3 rows from which they were selected in 1934.

Tests of 312 F_4 and F_5 selections from 10 crosses inoculated with a mixture of 20 bunt biotypes gave 0 to 91 per cent. infection, the average of each cross varying from 0·3 to 9·8 per cent. bunt, while 139 rows were bunt-free. This group offers promising material from which to select super-resistant strains for commercial use. Twenty-seven F_5 selections of Oro × Hybrid 128 and six F_5 selections of White Odessa × Ridit were of sufficient promise to be advanced to the yield tests in 1936. Several selections of Oro × Hybrid 128 were consistently more resistant than the Oro parent in the F_3, F_4, and F_5 generations.

Reciprocal crosses of Baart-Ridit × Federation were tested in the F_3 generation for resistance to three bunt forms, viz. T–1, *T. levis* [*T. foetens*] from Ridit wheat and *T. tritici* [*T. caries*] from Ridit. Baart-Ridit is resistant and Federation susceptible to T–1 and the Ridit form of *T. foetens*; both are resistant to the Ridit form of *T. caries*, as were also all of the 90 F_3 families. Both T–1 and the Ridit form of *T. foetens* produced transgressive segregation, indicating more than one factor for resistance. The most striking example of inherited resistance to the standard mixture of 20 bunt forms was found in 48 spring segregates from a cross between Federation and Ridit; all were highly resistant, 34 being bunt-free, and 14 producing from a trace to 1 per cent. infection.

In the section dealing with plant pathology (pp. 50–53) it is stated that in seed disinfection tests against wheat bunt, carried out by F. D. Heald, C. S. Holton, and E. F. Gaines, basic copper sulphate reduced infection to a negligible amount (0 to 0·1 per cent.) and caused improved germination after the seed had been stored for one year; copper arsenite was no better than copper carbonate in reducing infection due to soil contamination. Washing reduced seed-borne infection in one instance from 25·6 to 3·1 per cent.

In a study on bitter pit, F. D. Heald and R. Wellman found that apple trees known to produce affected fruit [ibid., xv, pp. 300–2] in

some cases showed a very evident mosaic mottle on the leaves very early in the season, while in others the mosaic symptoms were very faint [ibid., xiv, p. 639]. Field studies in spring and early summer demonstrated that a faint mosaic mottle of various apple varieties is common throughout the Wenatchee district. Cherry trees in the irrigated valleys of central Washington also showed a mosaic mottle [ibid., xiv, p. 368].

In western Washington, L. K. Jones and F. Johnson found that considerable damage was caused to peas, especially market-garden varieties, by mosaic [ibid., xv, pp. 28, 274] and streak [ibid., xi, p. 218]. Preliminary tests indicated that the viruses concerned are seldom seed-borne. A study of the symptoms set up and the virulence, host range, percentage transfer, longevity, and thermal death point of the viruses showed that two distinct mosaic diseases were commonly present on peas.

Eritrea : plant diseases and pests observed since 1930.—*Int. Bull. Pl. Prot.*, x, 1, pp. 2–4, 1936.

A list, compiled at the Agricultural Bureau of Eritrea, is given of the fungi, bacteria, virus, and physiological diseases, and insect pests observed since 1930 affecting cultivated and wild plants in the Colony.

Van der Goot (P.). **Ziekten en plagen der cultuurgewassen in Nederlandsch-Indië in 1934.** [Diseases and pests of cultivated crops in the Dutch East Indies in 1934.]—*Meded. Inst. PlZiekt., Buitenz.*, 85, vii+94 pp., 1935.

Among the many references of interest in this report, prepared on the usual lines [*R.A.M.*, xiv, p. 742], the following may be mentioned. Mouldy rot [*Ceratostomella fimbriata*] of *Hevea* rubber was prevalent and severe in West Java, where stripe canker [*Phytophthora palmivora*] and brown bast [ibid., xii, p. 80] were also reported, the latter occurring chiefly on less favourably situated estates where an unduly frequent tapping system was practised. In elevated positions mildew [*Oidium heveae*] was prevalent and more active steps were taken for its control by sulphur dusting than in 1933. This disease was also reported from Central Java, Malang, and the General Experiment Station of the A.V.R.O.S. In two young plantations on the north coast of Central Java the brown root fungus (*Fomes noxius*) [ibid., xv, p. 136) was observed. *Ganoderma pseudoferreum* assumed a serious form in a plantation under the supervision of the General Experiment Station, causing decortication of the tap- and side-roots, collar, and stem.

Coffee in Central Java was extensively attacked by *Corticium salmonicolor*, and a *Rhizoctonia* was responsible for damping-off in the seedbeds. Top die-back (*R.* sp.) [ibid., xv, p. 17] has now been found in most plantations in Malang and Kediri, seven new centres of infection having been observed in 1934. Efforts have been made to combat the disease by the excision of infected material in an incipient stage. From two estates at a high altitude in the Besoeki district symptoms resembling those caused by *C. koleroga* [ibid., xv, p. 3] were reported, but fructifications of the causal organism were not obtained.

Reports from the Java Sugar Industry Experiment Station at Pasoeroean state that sugar-cane mosaic is extremely prevalent, and

that in some plantations the widespread infection, not only of maize [see below, p. 386] but also of grasses in the vicinity, precludes the eradication of the disease from the setts. Yellow spot (*Cercospora kopkei*) [ibid., xiv, p. 153] was favoured by the damp, sunless period from December, 1933, to May, 1934, and assumed a much more serious form than in the preceding year. The same conditions were conducive to the development of pokkah-boeng (*F.* sp.) [*Gibberella moniliformis*: ibid., xiv, p. 743], especially in West Java. Gumming disease [*Bacterium vasculorum*: ibid., xv, p. 317] was prevalent among both setts and field canes in West Java.

Bact. [*Bacillus*] *aroideae* occurred both in the field (top rot) and in the curing-barn (hollow stalk) on a Deli (Sumatra) tobacco plantation [ibid., xiii, p. 274], involving a loss of 2,000,000 leaves. *Pythium* stem scorch was present throughout Deli, causing a maximum of 80 per cent. infection.

OKABE (N.). **Bacterial diseases of plants occurring in Taiwan (Formosa). VI.**—*J. Soc. trop. Agric. Taiwan*, vii, pp. 219–227, 1 fig., 1935.

In this paper [cf. *R.A.M.*, xiv, p. 738] full details are given of the symptoms and the morphological, cultural, and physiological characters of *Bacterium andropogoni* [ibid., ix, p. 774], the agent of a leaf and sheath disease of sorghum and broomcorn [*Sorghum bicolor* var. *technicus*], and of *Bacillus carotovorus* type B [ibid., x, p. 736; xi, p. 700] causing a soft rot of Welsh onions (*Allium fistulosum*) and leeks (*A. porrum*) in Formosa, Japan. Inoculations with the latter organism were successful on *A. cepa* (leaves and bulbs), potato, tobacco, tomato, and cabbage (seedlings), as well as on the hosts mentioned.

KOEHLER (B.). **Seed treatments for the control of certain diseases of Wheat, Oats, Barley.**—*Bull. Ill. agric. Exp. Sta.* 420, pp. 499–575, 17 figs., 1935.

The author describes a comprehensive series of seed disinfection experiments carried out against some of the major diseases of wheat, oats, and barley in Illinois during a period of 12 years with new organic mercury disinfectants and older materials, preceding his remarks with a brief historical résumé of cereal seed disinfection and a short account of the symptoms and control of the diseases concerned.

The results obtained [which are tabulated and fully discussed] showed that wheat bunt (*Tilletia levis*) [*T. foetens*] was controlled and good increases in yield obtained when the seed was treated with 18 to 20 per cent. copper carbonate, ceresan, and new ceresan at the rate of 2 or 3 oz., 2 oz., and ½ oz. per bush., respectively. The best results against wheat scab (*Gibberella saubinetii*) were given by the two last-named products, though with nearly disease-free wheat seed copper carbonate gave the best increase in yield. All three materials increased the winter survival of winter wheat. The benefits from treating non-infected wheat seed were not always commensurate with the trouble and expense involved, and where wheat is not a major crop but is grown in rotation, the seed should be treated only when bunt or scab occurs; where, however, wheat is grown more extensively, the seed should be disinfected annually.

The oat smuts (*Ustilago avenae* and *U. levis* [*U. kolleri*]) were well controlled by formaldehyde, applied as a spray (1 part formalin to 1, 2, or 3 parts water, 1 qt. solution to 50 bush., applied by a hand spray to each shovelful as it is picked up), sprinkle (1 pt. to 80 bush.), or dust, ceresan, and new ceresan, the increased yields given by the last-named as compared with formaldehyde more than compensating for the extra cost. Formaldehyde spray or sprinkle was the cheapest treatment, and is recommended as a second choice after new ceresan. The formaldehyde dust deteriorated rapidly in storage. Ceresan and new ceresan significantly increased yields when smut-free oat seed was used.

Ceresan and new ceresan were outstanding in controlling barley smut (*U. nigra* [*R.A.M.*, xv, p. 211] and *U. hordei*), stripe (*Helminthosporium gramineum*), and scab (*G. saubinetii*), and in increasing yields, but as *U. nuda* is controllable only by the hot-water treatment an objectionable amount of smut may persist after treatment with new ceresan. The Wisconsin Pedigree 38 barley variety being highly resistant to stripe [ibid., xiii, p. 155], and not having shown much smut infection in Illinois, seed treatment is recommended for this variety only when the seed is scabby or smut infection becomes important.

No damage resulted when copper carbonate-treated oat seed was stored for one year, but when seed treated with formaldehyde dust, ceresan, or new ceresan was stored even for a week some depression in yields resulted, longer storage conducing to still greater injury. If, however, the approximate storage period is known it is believed that a dosage can be determined that will give as good results as treatment immediately before sowing.

As wheat bunt balls in the seed cause some infection in spite of treatment they should be removed by proper cleaning machinery [ibid., xv, p. 286].

IMAI (S.). **On the causal fungus of the Typhula blight of gramineous plants.**—*Jap. J. Bot.*, viii, 1, pp. 5–18, 4 figs., 1936.

In the spring of 1926 the globose, oblong, or irregular, reddish-brown sclerotia, 0·5 to 4·5 mm. in diameter, of the species of *Typhula* responsible for the snow blight of wheat, barley, oats, and other Gramineae in Japan [*R.A.M.*, xiv, p. 568] were sown on moist sand in a pot, and in the following autumn rose-coloured fruit bodies, 3·5 to 30 mm. in height, were formed, the clubs of which measured (average of 50) 0·9 to 3·5 by 0·2 to 1 mm., the stipes 1 to 4 by 0·2 to 0·6 mm., and the spores 7·5 to 12·2 by 3·8 to 5·6 μ. Two years later similar fructifications were collected in a field in Hokkaido where a cereal crop had been badly damaged by the blight in the previous season. In 1929 fructifications identical with the foregoing were produced by sclerotia from several localities in northern Honshu. In 1932 a comparative cultural study was made, on a number of standard media, of the Japanese *Typhula* and material of *T. graminum* from Holland, the clubs, stipes, and spores of which measured, respectively, 0·8 to 4·5 by 0·3 to 1 mm., 1 to 2·5 by 0·2 to 0·5 mm., and 9·3 to 13·1 by 4 to 6 μ; these dimensions are in close agreement with those of the Japanese fungus, and in fact the sole difference between the two was the colour of the mycelium on malt extract agar, the Japanese (under surface) ranging from pale

ochraceous-salmon to salmon-buff and the Dutch from orange-cinnamon to light vinaceous-cinnamon.

The characters of the Japanese fungus under observation are very similar to those of *T. elegantula* Karst. with which the author formerly considered it identical [ibid., ix, p. 29]. It differs, however, from this species in the presence of sclerotia. The customary identification of the fungus with *T. graminum* Karst. [loc. cit.] cannot, in the writer's opinion, be maintained owing to important differences in the fructifications, and the author considers that the name *T. itoana* which he proposed for it in 1929 should be adopted. The Dutch strain is regarded as identical with it. The sterile fungus referred by Eriksson in 1879 to *T. graminum* on account of the resemblance of its sclerotia to those of the supposed hibernating form, *Sclerotium fulvum* [*R.A.M.*, viii, p. 439; xiii, p. 434], is thought to be also probably identical with *T. itoana*. The same may also well apply to the fungus investigated by Hungerford and Remsberg in the United States [ibid., xii, p. 367].

WALDRON (L. R.) & CLARK (J. A.). **Breeding rust-resistant spring Wheats.**—*Science*, N.S., lxxxiii, 2144, pp. 106–108, 1936.

The disastrous epidemic of stem [black] rust of wheat [*Puccinia graminis*] in North Dakota and neighbouring States in 1935 (the worst since 1916) has again emphasized the major importance of breeding for resistance as a means of combating the disease. During the past year promising results were given by certain hybrids between the resistant Hope variety [*R.A.M.*, xv, p. 284] or H-44 (an allied strain) and various susceptible but commercially more successful wheats. At Langdon, for instance, where the incidence of infection approached 100 per cent. and Ceres and Marquis yielded, respectively, only 3·3 and 0·4 bush. per acre, Hope itself produced 15·5 bush. and various hybrids with Hope as one parent gave up to 18·7 and showed little trace of the disease. In some of the crosses, e.g., Hope×Ceres, resistance to rust was accompanied by other desirable characters. From another cross combining the Australian variety Florence with Hope and Ceres a yield of 23·3 bush. per acre was obtained.

Besides Hope and Marquillo, only one named rust-resistant variety (Thatcher) had been distributed before 1935, but the encouraging outcome of the hybrid tests during that critical season is thought to afford a sound basis for future breeding work, more especially as the virtual immunity of the emmer progenitor gives every indication of permanence.

BRYZGALOVA (Mme V. A.). Бурая ржавчина Пшеницы в условиях Иркутско-Нижне-Удинской зоны Восточносибирского края. [Brown rust of Wheat under the conditions prevalent in the Irkutsk-Nijne-Udinsk region of East Siberia.]—*Тр. Защ. Раст. вост. Сибири* [*Bull. Pl. Prot. E. Siberia*], 2(4), pp. 99–174, 6 graphs, 1935.

This is a tabulated, summarized account of the author's studies and observations on brown wheat rust (*Puccinia triticina*) [*R.A.M.*, xiv, p. 292; xv, pp. 83, 201] since 1926 in the region of East Siberia extending from Irkutsk to Nijne-Udinsk, where it is stated to be the only cereal rust of economic importance. It was found that in the western

part of this region the rust is capable of overwintering in the uredo stage on volunteer wheat plants, and that, in general, infection of cultivated wheat starts in the spring about the second half of June, evidently from such volunteers since no importation of the rust from outside was observed, and the first infection of *Thalictrum* spp. is usually seen some five to ten days after the first appearance of uredosori on the wheat. In the forest-steppe zone teleutospores do not mature every year, owing to low rainfall in the autumn and drought conditions in early spring.

The intensity of spring infection of wheat with brown rust in East Siberia is chiefly determined by the overwintering of the uredospores, the date of primary infection of the wheat, the occurrence of adequate and frequent rain and of minimum night temperatures not below 8° C. in June, and a more or less regular alternation of rainy and sunny, warm days in July. Early and severe infection, reaching its maximum at the flowering stage, results in a loss of crop ranging from 65 to 75 per cent.; later infection, reaching its maximum at the milky maturity stage of the grain, gives from 54 to 63 per cent. loss; while moderate infection reaching its maximum at the waxy maturity stage, only causes 28 to 31 per cent. loss; light infection, on the other hand, with the maximum attack at the time of the milky maturity stage, generally gives only 6 to 10 per cent. reduction in yield.

The results of the investigations indicated that locally the rust may be best controlled by very early sowing of the wheat, since such crops suffered considerably less damage from the rust than later ones; by careful and early harvesting and removal of the wheat, to avoid shedding of the grain from the ears; and by early and thorough ploughing up of wheat stubble, to prevent the growth of volunteer wheat plants.

Bryzgalova (Mme V. A.). Оценка сравнительной устойчивости сортов яровой Пшеницы к мокрой-головне и бурой ржавчине для Прибайкальской части Восточносибирского края. [Evaluation of the relative resistance of spring Wheat varieties to bunt and brown rust in the Lake Baikal region of East Siberia.]—*Тр. Защ. Раст. вост. Сибири* [*Bull. Pl. Prot. E. Siberia*], 2(4), pp. 175–203, 1935.

The author states that owing to the peculiar climatic conditions in East Siberia, especially the long, dry, and cold springs, spring wheats are very liable to be attacked by bunt [*Tilletia caries* and *T. foetens*: *R.A.M.*, xiv, pp. 22, 225], fields with 80 to 90 per cent. infection being in no way exceptional some years ago, while even at present crops showing as much as 50 to 60 per cent. infection are quite frequent in the less progressive collective farms. For the same reasons seed-grain disinfection is not always effective in protecting the wheat crop from bunt, and the development of bunt-resistant wheat varieties is therefore all the more imperative. Observations since 1931 and careful varietal resistance tests in 1933 and 1934 [the results of which are tabulated] showed that all the local varieties are more or less susceptible, and that even such varieties as Hordeiforme 010, Lutescens 062, and Milturum 0321, which exhibit high resistance in the rest of the U.S.S.R., are considerably more susceptible in East Siberia. The first-named variety was the only one to show relative resistance to bunt in the tests.

Similar varietal tests in the same years for resistance to brown wheat rust (*Puccinia triticina*) [see preceding abstract], the results of which are also tabulated, equally showed the absence of local varieties highly resistant to the rust; moderate resistance under the local conditions, combined with acceptable commercial qualities, was only exhibited by the imported varieties Garnet, Kamalinsky 2559, and Kitchener, all of which are very susceptible to bunt. Conversely, the moderately bunt-resistant Lutescens 062 is highly susceptible to brown rust.

GIGANTE (R.). **Ricerche sopra l'influenza del boro sulla resistenza delle piante agli attacchi parassitari.** [Researches on the influence of boron on plant resistance to parasitic attacks.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 3, pp. 471–483, 1 fig., 1935. [English summary.]

When wheat of the highly susceptible Michigan Bronze variety was grown in the greenhouse in pots containing soil to which sodium borate was added at the rate of 1, 2, 4, 8, and 16 gm. per sq. m. of soil surface [cf. above, p. 338] and the plants were artificially inoculated with the uredospores of *Puccinia triticina*, the resultant infection was very severe (type 4) in the control pots and those containing 4 gm. or less of sodium borate per sq. m., while it was less so in the pots containing sodium borate at the rate of 8 (between type 3 and type 2) and 16 gm. (type 3) per sq. m. In field plot tests with Mentana wheat soil applications of sodium borate at the rate of 0·5, 1, 2, and 5 gm. per sq. m. of soil surface reduced infection by *P. glumarum*, and markedly stimulated growth.

SIBILIA (C.). **Relazione sulle esperienze di lotta diretta contro le ruggini del Grano nell' anno 1935.** [An account of experiments on the direct control of Wheat rusts in the year 1935.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 3, pp. 484–489, 1935.

In a further test carried out near Alessandria, northern Italy, in 1935, during weather strongly favourable to infection, a field of Damiano Chiesa wheat was dusted with natural sulphur at the rate of 40 kg. per hect. on 25th May (after four days' rain), 4th June (after four days of rain and wind), and 10th and 17th June. Rust (*Puccinia triticina* and *P. glumarum*) [*R.A.M.*, xiv, p. 293] infection was exceedingly slight, but the beneficial effect of the dusting was shown in the increased yield of the treated wheat over the untreated, the figures being 47·17 and 46·33 quintals per hect., respectively, yielding a profit of L. 0·60 per hect. This result is considered to indicate that dusting with natural sulphur is not uneconomical even in seasons when rust infection is practically negligible.

JOHNSON (T.) & JOHNSON (O.). **Studies on the nature of disease resistance in cereals. III. The organic nitrogen content of mature and immature tissues of the Wheat plant in relation to stem-rust resistance.**—*Canad. J. Res.*, xiii, 6, pp. 355–357, 1935.

The results of the studies reported in this paper [cf. *R.A.M.*, xiv, p. 226] showed that in six wheat varieties examined about one week before the emergence of the flag leaf the organic nitrogen content of the immature tissues (i.e., the leaves folded within the uppermost sheaths)

was less than that of the mature tissues (i.e., the fully-grown leaves of the upper halves of the plants). The greater susceptibility of the younger tissues to stem [black] rust [*Puccinia graminis*] as compared with the mature ones cannot, therefore, be attributed to a higher nitrogen content of the former [cf. ibid., xiv, p. 88].

COSTANTIN (J.). **Actualités biologiques. Le problème des rouilles du Blé à l'heure présente.** [Biological notes. The problem of Wheat rusts to-day.]—*Ann. Sci. nat., Bot.*, Sér. X, xvii, 2, pp. i–xviii, 1935.

After pointing out that in attempts to breed a type of wheat resistant to rusts (*Puccinia* spp.) workers have failed to take into consideration the known effects of high altitudes and high latitudes in increasing the vigour of the plants, and have neglected to introduce 'mountain blood' into the hybrids, the author refers to the relationship in Kenya between altitude and the resistance of Equator wheat to rust [*R.A.M.*, xiii, p. 222] and of coffee to *Hemileia vastatrix* [ibid., i, p. 51], and suggests that it may be possible to develop a type of wheat resistant to rust in mountain areas in Europe. In a preliminary test at Versailles Equator wheat showed some resistance to *P. glumarum*.

OLGYAY (M. v.). **Beizungsuntersuchungen mit Wasserstoffsuperoxyd im Laboratorium.** [Disinfection experiments with hydrogen peroxide in the laboratory.]—*Z. PflKrankh.*, xlvi, 1, pp. 1–6, 1936.

As already shown by Pichler and confirmed in the writer's laboratory tests at Budapest, hydrogen peroxide at the rate of 3 l. per 100 kg. of seed-grain is ineffectual against wheat bunt [*Tilletia caries* and *T. foetens*] at all concentrations [*R.A.M.*, xiv, p. 619]. Used at the rate of 4 l. per 100 kg. in a 20 per cent. concentration the preparation inhibited the germination of the fungi but simultaneously reduced that of the wheat. A further disadvantage of hydrogen peroxide is its costliness.

BRIGGS (F. N.). **Inheritance of resistance to bunt, Tilletia tritici, in hybrids of Turkey Wheats C.I. 1558 B and C.I. 2578.**—*Hilgardia*, x, 1, pp. 19–25, 1 graph, 1935.

In these studies on the inheritance of resistance to *Tilletia tritici* [*T. caries*] in wheat (physiological form VIII of Bressman being used as inoculum) [*R.A.M.*, xi, p. 33, and above, p. 344], hybrids of Turkey 1558 B with Baart gave progeny approximately in the ratio 1 resistant, 2 segregating, and 1 susceptible, both F_2 and F_3 data indicating that resistance is incompletely dominant. Crossing with Turkey 3055 showed that the major factor for resistance is the Turkey factor [ibid., xiii, p. 361]. Hybrids of Turkey 2578 with Baart approximated closely to the 1 : 2 : 1 ratio, and further evidence that the resistance of the former results from a single factor was furnished by crossing it with Martin, when the progeny segregated in close agreement with the 15 : 1 ratio, this segregation being similar to that of Martin × Turkey 1558 B. These data indicate that resistance is incompletely dominant and the factor for resistance was found to be the Turkey factor also. This makes a total of five wheat varieties, all of the Turkey type, depending for resistance on the Turkey factor. One variety of the Turkey type, Sherman, has already been found to have the Martin factor [loc. cit.]

for resistance, and the fact that two of the three major factors for resistance are thus present in Turkey wheats should facilitate their combination in a single variety of the Turkey type.

KOSTOFF (D.). **Inheritance of natural immunity in plants with special reference to production of immune varieties by interspecific hybridization.**—*Ann. Acad. tchécosl. Agric.*, x, 4, pp. 389–402, 7 figs., 1935. [Czecho-Slovakian summary.]

Following a concise discussion of the cytogenetical principles underlying plant breeding work for transmission to susceptible species or varieties of the natural disease resistance of other varieties by intra- and interspecific and intergeneric hybridization [*R.A.M.*, xiv, p. 116 *et passim*], with particular reference to wheat, the author states that his investigations of the problem in crosses of the highly disease-resistant *Triticum timopheevi* [ibid., xiv, p. 225] (28 chromosomes) showed that this wheat may be crossed with some difficulty with all the other *Triticum* species, as well as with rye and *Haynaldia* [*Agropyron*] *villosum*; it was further found that one of the *T. timopheevi* genoms (7 chromosomes) conjugates with the A genom of the other wheat species, while the other genom conjugates only partially with the B genom of the latter. If the immunity of *T. timopheevi* is localized in the conjugating chromosomes, it may be possible to transfer its immunity to the other species of *Triticum*, after the usual self-sterility of the hybrids (single grains are rarely set) is overcome by back-crossing. The chromosomes of rye do not usually conjugate with those of *Triticum* species, this rendering very problematical the possibility of transferring its disease resistance to wheat.

The breeding of the sugar-cane P.O.J. 2878 is cited as an instance of the successful application of cytogenetic methods, and the author is of opinion that the production of immune varieties is most surely and rapidly effected by hybridization in conjunction with genetic and cytogenetic investigations of the material.

STEINER (H.). **Die Halmbruch- oder Lagerfusskrankheit des Getreides.** [The strawbreaking or lodging foot rot of cereals.]—Reprinted from *Landeskultur*, [ii], 8, 4 pp., 2 figs., 1935.

A semi-popular description is given of the foot rot of cereals caused by *Cercosporella herpotrichoides* [*R.A.M.*, xv, p. 288], the presence of which was established for the first time in Austria in 1935 on wheat samples from Burgenland and Lower Austria.

STRAIB (W.). **Untersuchungen über erbliche Blattnekrosen des Weizens.** [Investigations on hereditary foliar necroses of Wheat.]—*Phytopath. Z.*, viii, 6, pp. 541–587, 10 figs., 1935.

A comprehensive, tabulated account is given of the writer's studies at the Brunswick Botanical Institute on certain hereditary necrotic disorders affecting wheat (*Triticum vulgare* of the Heines Kolben and related types, *T. compactum*, *T. durum*, and *T. polonicum*) leaves and assuming in the two first-named the form of an extensive brownish-yellow discoloration produced by the gradual coalescence of a number of originally isolated lesions, and in the others a more restricted bluish-

grey spotting. The conditions are believed to arise from a gene mutation at some indeterminable period in the ancestry of the selections under observation.

The symptoms may develop at any stage in the growth of the plants, and in severe cases the foliar tissues undergo complete necrosis so that the leaves die off in succession. However, since each newly-formed leaf is capable of functioning for from two to three weeks according to external conditions, while the sheaths and haulms are also able to assimilate, the vital processes of the plant are not entirely impeded. The necrosis begins with a degeneration of the sclerenchymatous tissue, gradually extending over the whole mesophyll. In hereditary necrosis the loss of chlorophyll is heavier than in that due to yellow rust (*Puccinia glumarum*), and the degeneration sets in at a period when no external symptoms are discernible.

The occurrence of necroses of the foregoing types is strongly influenced by temperature; in *T. vulgare*, though not always in other species, their development is suppressed when a temperature of 15° C. persists for any length of time. Plenty of light is required to promote the extension of the necroses, which are little in evidence during the short days of December and January even under favourable temperature conditions. An adverse effect on the occurrence of these disturbances is further exercised by an excess of nitrogen and a complete absence of potash in the fertilizer. The optimum carbon dioxide concentration for the necroses is 0·3 per cent.; at 4·5 per cent. they are temporarily masked. These physiological data indicate that there is no apparent connexion between hereditary necrosis and grey speck [see below, p. 355] in spite of the similarity of the symptoms.

The simultaneous occurrence in a given variety of hereditary necrosis and *P. glumarum* may to some extent invalidate the usual technique of judging varietal reaction to yellow rust, more especially as the optimum temperatures for the development of both diseases coincide or overlap.

In Kolben wheat selections the inheritance of necrosis follows Mendelian laws. Experiments on the F_1 to F_4 generation showed that the condition is a simple recessive character transmissible by one nuclear gene. In addition to the factor pair *Nec nec* modifying factors would also appear to be operative. The disorder may entail a loss of grain ranging from 7 to 21 per cent. in Kolben wheat.

DIEUDONNÉ (P.) & VANDERWALLE (R.). **Recherches sur la désinfection des semences d'Orge dans la lutte contre Ustilago nuda (Jensen) Rostrup.** [Studies on the seed disinfection of Barley in the control of *Ustilago nuda* (Jensen) Rostrup.]—*Bull. Inst. agron. Gembloux*, iv, 4, pp. 366–377, 1935. [Flemish, German, and English summaries.]

In studies on the control of loose smut of winter barley (*Ustilago nuda*) [*R.A.M.*, xiv, pp. 27, 296; xv, p. 8] treatment without pre-soaking was ineffective even at temperatures as high as 53° to 54° C. for periods of 20 minutes. A relationship was found to exist between the duration of the pre-soaking and immersion periods. Pre-soaking for 2 hours at 25° was efficacious when the subsequent treatment lasted

for 30 minutes at 50° or for 5 minutes at 52°. Pre-soaking for $2\frac{1}{2}$ hours at 25° and subsequent treatment for 15 minutes at 50° was also satisfactory, while 5 minutes at 52° did not reduce germination. Pre-soaking for 3 hours at 25° and subsequent treatment for 10 minutes at 50° was also effective.

Immersion in 4 per cent. ethyl alcohol for 3 hours at 25° followed by 20 minutes' hot-water treatment at 45° gave complete control but markedly reduced germination. Treatment at 45° for 2 hours gave satisfactory disinfection but caused great diminution in the germinative capacity of the grain. Immersion at 45° for 1 hour in water containing 0·5 per cent. alcohol gave complete disinfection but also seriously reduced germination.

NICOLAISEN (W.). **Untersuchungen mit Herkünften des Haferflugbrandes in Rahmen der Immunitätzüchtung.** [Experiments with collections of loose smut of Oats from the standpoint of breeding for immunity.]—*Z. Zücht.*, A., xx, pp. 318–345, 1935.

Following a reference to his earlier communication [*R.A.M.*, xiii, p. 364] on the breeding of oat varieties immune from loose smut (*Ustilago avenae*) and to Schattenberg's report on the preliminary work done in Halle in 1931–2 [ibid., xiv, p. 231], the author gives a tabulated account of the continued experiments there in 1933 and 1935, in which the reaction was tested of 29 oat varieties to 27 different collections (from individual oat varieties) of the smut which are prevalent in Germany. The results clearly demonstrated the extremely complex genetical constitution of the oat varieties from the standpoint of their reactions to the collections, no two varieties responding similarly to all the smut collections. In like manner the smut collections all differed from each other in their pathogenicity to the various varieties of oats. Some of the latter, such as Ferguson's Navarro, the Argentine La Estanzuela and Avena amarilla [yellow], Markton C.I. 2053, a local oat from Uruguay, Red Rustproof, Algerian, and Black Mesdag, showed varying degrees of high resistance (sometimes complete) to all the collections, and so offer very promising breeding material; a few others, however, which were also highly resistant or immune in the German tests, such as Fulghum and the Australian Gnyra, have been reported elsewhere as susceptible to certain strains of *U. avenae,* which considerably reduces their value in hybridization work.

In another table the results are summarized of infection experiments from 1929 to 1934, inclusive, with 19 collections of *U. avenae* on the four differential oat varieties Eckendorf Early, Petkus Yellow, Lischow's Early, and Gopher, followed by a detailed discussion of the pathogenicity of each smut collection tested. The results again confirmed the entirely different selective reaction of the oat varieties to the smut collections, and showed that the former are therefore very favourable material for the study of the nature of inheritance of resistance or susceptibility to the smut.

The work is considered to have shown the necessity in resistance tests of using as inoculum mixtures of as many smut collections as possible from a given region, including also the spores that are formed on the differential hosts in the experiments, since it is possible that new forms

of the parasite may arise through hybridization. Environmental conditions were shown to have a considerable influence on the development of the smut, e.g., too intense or too low lighting in the greenhouse inhibited sporulation. This indicates the necessity of carefully adjusting experimental conditions so as to render them as similar as possible to those obtaining in the field.

RADEMACHER (B.). **Genetisch bedingte Unterschiede in der Neigung zu physiologischen Störungen beim Hafer (Flissigkeit, Dörrfleckenkrankheit, Urbarmachungskrankheit, Blattröte).** [Genetically conditioned differences in liability to physiological disturbances in Oats (blast, grey speck, reclamation disease, and leaf reddening).] —*Z. Zücht.*, A, xx, pp. 210–250, 3 figs., 2 maps, 1935.

A comprehensive, fully tabulated account is given of the writer's studies at the Kiel-Kitzeberg branch of the Biological Institute on the hereditary basis of the conditions predisposing oats to blast or English blindness [*R.A.M.*, xv, p. 11], grey speck [see next abstract], reclamation disease [ibid., xv, pp. 87, 145], and leaf reddening.

Although the development of blast is largely dependent on external conditions, such as weather, methods of cultivation, and place of origin of the seed, the degree of liability to the disturbance was found to differ considerably in the 111 varieties tested from 1929 to 1933 and must be regarded, therefore, as a fixed genetic character. Among the standard selections, those of the Probstei and Victory groups suffered most and the black moorland types least severely; among other resistant varieties may be mentioned Marktredwitz Fichtelgebirgs, Borries, Carstens IV, Peragis Early II, Mansholts, Kanota, Richland, *Avena strigosa*, and *A. byzantina*.

Of the 82 varieties examined for their reaction to grey speck from 1930 to 1933, none of the *A. sativa* group was entirely resistant, but marked differences in the virulence of the disease were observed, extreme susceptibility being shown, for instance, by Endress Franken, strong liability by v. Lochow's Yellow, Peragis Early II, and Richland, and a high degree of resistance by Svalöf's Glocken [Bell] III and Weibull's Argus; of the other *A.* spp. tested, *A. sativa orientalis pugnax* was very severely affected, *A. barbata*, *A. strigosa*, and *A. brevis* scarcely at all, and *A. byzantina* slightly. A correlation was observed between marked liability to blast (involving heavy water requirements) and a strong tendency to grey speck, but resistance to the former did not necessarily connote a similar reaction to the latter disturbance. A form of grey speck in which the typical lesions are replaced by carmine- to brownish-red, spherical, oval, or elongated areas with dark or light centres is characteristic of certain resistant varieties and appears to represent a defensive reaction on the part of the plant. In 1933 a number of varieties, after overcoming the characteristic symptoms of grey speck (a phenomenon usually observed some time before the close of the growing period), developed severe yellowing of the apical leaves and blindness of the panicles. Lodging was found to be prevalent among plants suffering from grey speck. For mildly affected soils there are quite a number of varieties that may safely be cultivated, but in dry seasons these types would probably fail on heavily diseased areas

and there is a wide field for breeding to combine resistance to grey speck with other desirable qualities.

Complete immunity is apparently no more to be expected in the case of reclamation disease than in that of grey speck, but a very high degree of resistance was shown by *A. strigosa*, while in the *A. sativa* group the black moorland types gave satisfactory results during the experimental period (1930 to 1933). The grey speck-resistant Swedish black was very susceptible to reclamation disease and all the white and yellow varieties tested, with the possible exception of P[ommersche] S[aatzucht] G[esellschaft] Gold, were more or less susceptible. Reclamation disease is not so exclusively associated with the juvenile stage of growth as grey speck, and the full extent of the damage from this source cannot as a rule be estimated until the close of the growing period. In the resistant moorland varieties the characteristic whitening of the tips is replaced by reddish lesions similar to those of the atypical form of grey speck. As in the case of grey speck, susceptibility to reclamation disease is to some extent correlated with hygrophytic properties, but the xerophytic types are by no means uniformly resistant. Support for the view that reclamation disease is a manifestation of copper deficiency is thought to be afforded by the higher yields in 1933 of original seed from mineral-containing soils as compared with those from the first year's progeny in which the reserves were already depleted, but this aspect of the problem requires further investigation. In connexion with the prospects of breeding for resistance to reclamation disease it is mentioned that certain crosses between Black Mesdag and standard German varieties which are immune from loose smut [*Ustilago avenae*: see preceding abstract] were little affected either by this trouble or grey speck.

Leaf reddening, first described by the writer in 1932 (*Arch. PflBau.* viii, p. 456, 1932), is characterized by a reddish-yellow to carmine spotting or striping of the leaves, beginning with the lowest and in severe cases extending to the haulm. The discoloured leaves twist spirally, turn a dirty brown to blackish-red colour, and die off, the process of destruction being finished by blackening fungi and moulds. Panicle production is retarded or suppressed. A fairly well-marked correlation was established between this disturbance and blast. Of the 52 varieties tested in 1929 and 1932 for their reaction to leaf reddening, the Probstei group suffered most, while certain black moorland types and others, including Weihenstephan Goten, Lüneburger Kley, and Carstens III, were little affected.

In conclusion the writer discusses the comparative reactions of the different varieties to the disorders under observation from the ecological and plant-breeding standpoints.

GERRETSEN (F. C.). **The effect of manganese deficiency on Oats, in relation to soil bacteria.**—*Trans. third int. Congr. Soil Sci.*, i, pp. 173–174, 1935.

Certain aspects of the grey speck disease of oats [see preceding abstract] do not appear to be explicable on the basis of manganese deficiency alone. Thus in Holland, when a manganese-deficient soil, on which the crop shows marked symptoms of grey speck, is sterilized with formalin, plants sown in the sterilized soil grow up healthy, although

the manganese content remains the same as before sterilization. Reduction of insoluble manganic-complexes to soluble manganous compounds, as suggested by Steenbjerg [*R.A.M.*, xv, p. 87], is excluded because there was no increase either of water-soluble or exchangeable manganese. Lundegårdh has shown [ibid., xii, p. 19] that the manganese content of diseased plants [in Sweden] may be even higher than that of healthy ones, thereby furnishing further evidence of the implication of some other agency in the etiology of the disorder. The reinfection of formalin-sterilized soil with 1 or 5 per cent. of the original soil led to the reappearance of the grey speck symptoms in their former intensity. Quartz sand cultures low in manganese remained healthy under sterile conditions, but developed the disease after infection with a few grams of unsterilized soil. Similarly, in sterile water cultures with little manganese, the plants were quite healthy, though somewhat stunted, whereas on infection with a diseased root tip or a mixture of bacteria isolated from diseased roots, they contracted the disturbance in a typical and virulent form. The addition to the culture solution of 0·001 to 0·002 per cent. germisan kept non-sterile plants with a low manganese content healthy, whereas the non-disinfected controls were severely attacked. On the basis of these facts, it is necessary to differentiate between the purely physiological effect of manganese deficiency (growth retardation) and the much more complex symptoms of grey speck, induced by a combination of factors.

Diseased roots of oats in the field, or in sand or water cultures, invariably show signs of microbiological disintegration. The alkaline products produced by moulds or bacteria in the root tips appear to be transported by the sap stream to the leaves, where they give rise to typical spots. When a leaf showing the first symptoms of grey speck was cut off and placed in a 0·1 per cent. solution of phenol red, it rapidly developed small, red spots corresponding to P_H 8·2. The presence of ammonia in abnormally large quantities was frequently detected in diseased plants, and the excess of this element probably retards the appearance of the symptoms during the winter when the bacteria liable to invade the roots are inactive. In the spring, after a few warm days, the disease breaks out vigorously.

No satisfactory explanation has hitherto been found for the occurrence of grey speck on mixtures of normal sand and clay. Pot experiments showed a much reduced and partially decayed root system in quartz sand mixtures with 10 and 25 per cent. clay. It may reasonably be inferred that this phenomenon is due, not only to the diffusion of alkaline substances from the clay into the adjacent sandy soil, causing the precipitation of soluble manganous compounds, but also to the development, under the influence of the favourable soil reaction in the diffusion zone, of certain manganese dioxide-precipitating bacteria and moulds.

Regarding the function of manganese the writer's experiments indicate that it intensifies photosynthesis by accelerating the oxidation processes connected with the photochemical reactions in the leaf. Shortage of manganese retards carbon assimilation and so leads to a carbohydrate deficit throughout the plant; consequently the roots remain small and cell division in their tips is so slow that they finally succumb to infection by micro-organisms. The leaf structure is weakened,

and the delay in the formation of organic acids, which would normally neutralize the minute quantities of alkaline substances produced by the root bacteria, probably accentuates the typical foliar spotting.

GORLENKO (M. V.). **Причины массового поражения Овса корончатой ржавчиной (Puccinia coronifera Kleb.) в 1933 году в Воронежской области.** [The causes of the epidemic outbreak of crown rust (*Puccinia coronifera* Kleb.) on Oats in 1933 in the Voronezh region.]—*J. bot. U.R.S.S.*, xx, 5, pp. 475–486, 1 graph, 1935. [English summary.]

The field observations reported in this paper were made in the Voronezh region [south Russia] during the years 1931 to 1934, the first two of which were marked by epidemic outbreaks of crown rust (*Puccinia coronifera*) [*P. lolii*: *R.A.M.*, xiv, p. 747] on oats, while the latter two were relatively free from the disease. It was again confirmed that buckthorn (*Rhamnus cathartica*) is responsible for the primary infection of the crop in the spring [ibid., xv, p. 211], but no correlation could be established between the severity of the rust attack on the buckthorn and that on oats. Two critical periods were observed determining the intensity of attack on oats, the first of which coincides with the dissemination of the aecidiospores and extends from about the second ten days of May to the end of the first ten days in June; during this period heavy rainfall increases rust attack, while drought suppresses it even in the presence of very abundant infective material from severely rusted buckthorns. A second critical period, at the time of mass formation of the uredospores, was found to last from the third ten days of June to the end of the first ten days of July, corresponding to the stages from the beginning of ear formation to milky maturity of the oat grain; this period is of particular interest, since severe infection at this time leads to a considerable reduction in total yield and in the specific gravity of the grain.

The severity of attack by *P. lolii* on the buckthorn is also largely determined by weather conditions. Warm rains and fogs during the last half of March and the whole of April induce a high germination of the teleutospores before the leaves open and thus reduce infection, while a rigorous winter followed by a spring with warm rains towards the end of April promotes the germination of the teleutospores at the time the leaves open out, and therefore favours infection.

MUNDKUR (B. B.). **Oat leaf infection by Ustilago avenae (Pers.) Jensen.**—*Indian J. agric. Sci.*, v, 6, pp. 745–746, 1 pl., 1935.

On the oat varieties Early Champion, Danish, and Danish Island the loose smut *Ustilago avenae*, rather rare in India, is recorded as attacking the upper leaves, in which it formed sori in parallel striae accompanied by longitudinal shredding of the leaves [*R.A.M.*, iv, p. 664].

BORZINI (G.). **Ricerche sul 'carbone del Granturco' (Ustilago zeae (Beck) Unger).** [Researches on Maize smut (*Ustilago zeae* (Beck) Unger).]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 3, pp. 389–423, 1 fig., 4 graphs, 1935.

Investigations carried out in Rome in 1934–5 showed that fresh chlamydospores of *Ustilago zeae* [*R.A.M.*, vi, p. 307; xiv, p. 690; xv,

p. 223] germinated readily in nutrient solutions (especially 1 per cent. glucose), but in water alone there was a delay of 45 days before germination took place in 1934, though a year later it began both in distilled and in spring water after 24 hours. Rapid germination with the production of sporidia took place in soil extracts. In acetic acid germination occurred only at concentrations below 1 per cent. The addition of 0·005 per cent. calcium cyanamide or 0·01 per cent. kainit to 1 per cent. glucose reduced the germination within 48 hours from 90 to 40 and from 90 to 70 per cent., respectively. Great resistance was shown to the action of ultra-violet rays, though when the exposure was made after germination had started the probasidium and sporidia produced were shorter and thicker than normal.

When chlamydospores of *U. zeae* were strewn on the surface of soil in pots and also buried at various depths, some of the pots being watered and the remainder kept dry, it was found that the buried spores showed a lower germination rate than those on the surface. Watering greatly reduced the vitality of the buried spores, the reduction being progressive from February to June, but stimulated the vitality of the surface-strewn spores. The humidity factor is probably of much practical importance, and the most favourable conditions for infection appear to be set up when a wet period occurs and the plants are in a susceptible stage of growth following a dry spell from February to May.

Heavy soil dressings with calcium cyanamide and kainit had practically no effect on infection. The severe outbreaks of *U. zeae* that occur on plots dressed with fresh stable manure are due, in the author's opinion, to the increased susceptibility of the treated plants and not to any stimulatory effect on the fungus.

That infections by *U. zeae* are entirely local and are due to air-borne spores and sporidia was demonstrated by the fact that when sporidia were artificially prevented from reaching the aerial parts of plants growing in inoculated soil no infection took place.

EDWARDS (E. T.). **Studies on Gibberella fujikuroi var. subglutinans the hitherto undescribed ascigerous stage of Fusarium moniliforme var. subglutinans and on its pathogenicity on Maize in New South Wales.** —*Sci. Bull. Dep. Agric. N. S. W.* 49, 68 pp., 25 figs., 1935.

This is an expanded version of the writer's studies on *Gibberella fujikuroi* var. *subglutinans* on maize in New South Wales, a preliminary note on which has already appeared [*R.A.M.*, xiii, p. 299].

The existence within the fungus of two biological strains has been demonstrated on material collected at Bathurst and Grafton, respectively. The mycelia of both grew most rapidly at 30° C., near which the optimum temperature probably lies. Striking cultural differences [which are summarized in tabular form] were observed on potato dextrose agar between the two strains at various temperatures from 5° to 40°, especially in the lower ranges. The viability of the mycelium in steamed maize grain cultures was found to persist for a period of 2¾ years at room temperature, while ascospores from material up to 18 months old germinated readily. A full morphological description and revised diagnosis of the fungus are given.

During the season of 1934–5 serious losses occurred in some districts

through defective germination and seedling blight due to the use of seed-grain internally infected by *G. fujikuroi* var. *subglutinans*. The examination of samples of seed-grain from the principal maize-growing areas of the Colony revealed a high percentage of internal seed-borne infection by this fungus (average 7·9), the corresponding figures for *G. moniliformis* [ibid., xv, p. 289], *Penicillium* spp., and *Cephalosporium acremonium* being 8·9, 6·8, and 5·3, respectively. Extensive seed-borne infection was shown by inoculation experiments to follow the application to the silks of the ears at the late milk to early dough stage of a spore suspension and the insertion into the shank attachment or basal ear tissues of fragments of agar cultures of *G. fujikuroi* var. *subglutinans*.

Comparative soil inoculation experiments with *G. fujikuroi* var. *subglutinans*, *G. moniliformis*, and *G. saubinetii* showed that each of these fungi is responsible for considerable reductions in the stand and consequent grain yield of maize under normal field conditions in New South Wales. Thus, at the New England Experiment Farm, Glen Innes, the percentages of seedlings surviving to maturity after inoculation through the soil by these three organisms were 66·4, 69·8, and 62·8, respectively, as against 100 in the uninoculated control plot, the corresponding mean yields per plot, 8 yds. long by 14 yds. wide, being 34·3, 32·3, and 39·5 oz., respectively, compared with 56·5 oz.

Some experimental evidence was obtained in the laboratory for the production of *G. fujikuroi* var. *subglutinans* of a stimulatory substance inducing premature germination of the grain, but under field conditions the parasite appears rather to exercise a depressing effect on seedling growth.

Buchheim (A.). **Einfluss von Brandbefall auf Wachstum und Habitusbild der Wirtspflanze.** [The influence of smut infection on growth and habit of the host.]—*Phytopath. Z.*, viii, 6, pp. 615–621, 3 figs., 1935.

Measurements of the length of healthy millet [*Panicum miliaceum* var. *subaureum*] plants and of those attacked by smut [*Ustilago panici-miliacei*] at the Moscow Agricultural Academy [*R.A.M.*, x, p. 181] showed the latter to be apparently longer (78·73±18·9 cm.) than the former (76·96±12·1 cm.), the corresponding figures for the stems being 57·3±1·0 and 36·6±0·692 cm., respectively. Thus the fungus exercises a stimulatory action on the growth of the leafy stem while suppressing that of the floral panicles, a difference presumably due to the intensive development of the mycelium in the former and to the relative inactivity of the reproductive organs in the latter. Similar relationships were observed in maize and sorghum attacked by *Sorosporium reilianum* [ibid., xiv, p. 504], while the growth of wheat ears infected by loose smut [*U. tritici*] was curtailed (average length of 115 diseased ears 30·13±4·3 cm. compared with 47·21±10·3 cm. for 122 healthy ones).

Ruggieri (G.). **Sopra i presunti rapporti genetici col Limone e col Cedro di una particolare varietà di Limone assai resistente alla 'Deuterophoma tracheiphila' Petri.** [On the presumed genetic relation with Lemon and Lime of a particular Lemon variety highly resistant to *Deuterophoma tracheiphila* Petri.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 3, pp. 496–499, 1935.

The Interdonato lemon, which is very resistant to *Deuterophoma*

tracheiphila [*R.A.M.*, xiv, p. 680; xv, p. 291], is stated to be morphologically and biologically distinct from the other lemon varieties grown in Sicily. It is supposed to be a hybrid between the ordinary lemon and lime [*Citrus medica*], but its chromosome content (9) has been found to be similar to that of other citrus varieties and the question of its hybrid nature must remain open pending further investigations.

BIRAGHI (A.). **Rilievi su alcuni Citrus a frutto acido presenti in India in relazione alla ricerca di forme resistenti al 'mal secco'.** [Notes on Citrus varieties with acid fruit found in India in relation to the search for types resistant to 'mal secco'.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 3, pp. 424–441, 1935. [English summary.]

A survey conducted in the northern and western regions of India to collect indigenous forms of lemons to be tested for resistance to mal secco (*Deuterophoma tracheiphila*) [see preceding abstract] showed that lemons are very scarce in India, limes (*Citrus aurantiifolia*) being used in their place. Many indigenous forms of citron (*C. medica*) were noted, but plants with all the characters of the lemon were found only in the Botanical Gardens of Saharanpur, United Provinces. Most of the forms of citrus that bear fruits with a yellow rind and sour juice have morphological characters intermediate between those of the lime and the lemon and must, apparently, be grouped separately. The results of the survey do not support De Candolle's view that India is the home of the lemon. No evidence of the presence of *D. tracheiphila* was found in India, but die-back of limes (*Colletotrichum gloeosporioides*) [*R.A.M.*, xiv, p. 692] was prevalent and a non-parasitic wilt of citrus due to insufficient depth of soil was also observed.

WEINDLING (R.) & FAWCETT (H. S.). **Experiments in the control of Rhizoctonia damping-off of Citrus seedlings.**—*Hilgardia*, x, 1, 1–16, 4 figs., 1936.

In laboratory, greenhouse, and field experiments carried out in California [a preliminary account of which has already been noticed: *R.A.M.*, xiv, p. 188], damping-off of citrus seedlings caused by *Rhizoctonia* [*Corticium*] *solani* was successfully controlled by acidifying the soil layers next to the seed by applying aluminium sulphate or acid peat moss. This produced an initial reaction of about P_H 4. The condition was not, however, controlled in sterilized soils of the same acidity in the absence of *Trichoderma* spp. [cf. above, p. 395] and the evidence obtained indicated that the decisive factor was a change in the soil microflora favouring organisms such as *Trichoderma*, which may be antagonistic to *C. solani*. The peat moss applications had a stunting effect on most of the seedlings, but the aluminium sulphate treatment showed promise as a practical means of commercial control.

JENKINS (ANNA E.). **Present generic status of the Citrus-scab organism.**—*Phytopathology*, xxvi, 1, pp. 68–70, 1 fig., 1936.

The writer compared parallel cultures of the citrus-scab organism named by her *Sphaceloma fawcettii* [*R.A.M.*, iv, p. 477] in 1925 with those of *Sporotrichum schenckii*, the first animal pathogen to be placed in the genus *Sporotrichum*, to which Miss Doidge and E. J. Butler

referred the fungus of citrus scab [as *S. citri*: ibid., iv, p. 164] in 1924. *Sphaceloma fawcettii* differed markedly from *Sporotrichum schenckii* [ibid., xv, p. 294] in its slower growth, much brighter colour (a feature in which it resembles *Elsinoe ampelina*) [ibid., xiv, p. 557], its rapidly developing, irregularly convolute colony (whereas cultures of *S. schenckii* remained devoid of convolutions for at least seven days), and in general appearance. It is shown in a forthcoming paper that *E. ampelina* is innocuous to rabbits, and there seems no reason, on the basis of these studies, to postulate a close relationship between the citrus pathogen and *S. schenckii*. *S. roseum*, regarded as the type of the genus by Clements and Shear, is clearly not related to *Sphaceloma fawcettii*.

JENKINS (ANNA E.). **A Sphaceloma on fruit of Hesperethusa crenulata, a remote Citrus relative from India.**—*Phytopathology*, xxvi, 1, pp. 71–73, 1 fig., 1936.

Hesperethusa crenulata (Roxb.) Roemer, a remote relative of the citrus family belonging to the tribe Triphasinae, was not found to be affected by scab (*Sphaceloma fawcettii*) [see preceding abstract] by Winston and his collaborators in Florida [*R.A.M.*, v, p. 29], but there is a previous record of the disease on fruits of this host (erroneously labelled *Limonia acidissima*) received by W. T. Swingle from the Royal Botanic Gardens, Sibpur, near Calcutta, in February, 1916. The roughly circular, raised or convex, sharply delineated lesions on the enlarged fruits bear in the centre dark, punctiform masses of microconidia and acervuli. The symptomatological features of the disease on *H. crenulata* bear a certain resemblance to those induced on sweet oranges in South America by *S. fawcettii* var. *viscosa* [ibid., xiv, p. 816], but further critical study is necessary to determine the exact systematic position of the organism concerned.

MARCHIONATTO (J. B.). **Argentine Republic : experiments on the control of scab of Citrus fruits.**—*Int. Bull. Pl. Prot.*, x, 1, pp. 1–2, 1936.

Sporotrichum citri [or *Sphaceloma fawcettii*: see preceding abstracts] was determined as the agent of typical markings diminishing the commercial value of citrus fruits in the Concordia district of Entre Ríos, Argentine [*R.A.M.*, xiii, p. 437], the mites constantly accompanying the lesions being without significance. Satisfactory control of the disease was obtained in K. Hayward's experiments by two applications of Bordeaux mixture combined with white emulsible oil, the first being given 15 to 30 days before flowering and the second after petal-fall.

LI (L. Y.). **Anthracnose of Hwangpee, Clausena lansium (Lour.) Skeels, in South China.**—*Lingnan Sci. J.*, xv, i, pp. 113–117, 4 figs., 1936. [Chinese summary.]

Hwangpee (*Clausena lansium*) [a remote relative of *Citrus*] in the Canton district of China was observed in June, 1935, to be severely attacked by an anthracnose disease estimated to affect 15 per cent. of the fruit on the local wholesale market. From the greyish-brown to black lesions, 1 to 1·5 cm. in diameter, bearing concentric rings of acervuli, the writer isolated a *Gloeosporium* with conidia 10 to 16·2 by

2·5 to 4·2 μ. Positive results were given by inoculation experiments with the fungus (which is believed to be closely related to *Glomerella cingulata*) [*R.A.M.*, xiv, p. 596 and next abstract] on papaw, chilli pepper (*Capsicum annuum*), guava, *Averrhoa carambola*, *Hibiscus sabdariffa*, avocado (*Persea americana*), sand pear (*Pyrus calleryana*), banana, orange, lemon, *Anona squamosa*, and *Citrus erythrosa*, in addition to its natural host. The conidial dimensions ranged from 5 to 8·95 by 2·5 to 3 μ (on banana) to 12·5 to 17·5 by 2·5 to 4·5 μ (on guava).

PALO (M. A.). **Notes on mottle-leaf and anthracnose fruit spot of Citrus in Bukidnon.**—*Philipp. J. Agric.*, vi, 4, pp. 497–500, 2 pl., 1 fig., 1935.

The most serious citrus disease in Bukidnon, Philippine Islands, is mottle leaf [*R.A.M.*, xv, p. 146] to which, of the commercial varieties generally grown locally, sweet orange is the most susceptible, followed by pomelo and mandarin. The disease killed several trees in two localities and reduced the yield in two others. The marked decline of yield on a number of citrus farms is attributed primarily to it. Control by applications of zinc sulphate is recommended.

Pomelo fruits in the same locality are commonly attacked by anthracnose due to the *Gloeosporium* stage of *Glomerella cingulata* [see preceding abstract]. The affected fruits, which are attacked in all stages of development, bear a few sunken, circular, orange-cinnamon spots, 5 to 40 or more mm. in diameter, sometimes accompanied by a clear, yellowish exudate which, if not washed off by rain, hardens into a transparent ochraceous-buff to ochraceous-tawny mass. Under favourable weather conditions, pinkish masses of fructifications develop, sometimes in concentric rings. In prolonged wet periods the spots spread rapidly and may cover entire fruits, while in dry weather their development is hindered, and they become hard and dry. The rind, locules, and core are attacked and badly affected fruits fall. The incidence of the disease appears to be favoured by the local climate and rainfall. Weakened trees are the most susceptible. Control consists in destroying affected material and spraying with Bordeaux mixture immediately before flowering, when most of the fruits have set, and again three weeks later.

PUTTERILL (V. A.). **Citrus wastage investigations. Progress Report No. 3. Season 1934.**—*Bull. Dep. Agric. S. Afr.* 149, 27 pp., 1 fig., 1 graph, 1935.

The results of further investigations in South Africa into mould [*Penicillium digitatum*] wastage in Navel oranges [*R.A.M.*, xv, p. 291] showed that at Zebediela the number of mouldy fruits removed at grader intake and during grading and packing approximated to one fruit in every four lug boxes. At Grahamstown the corresponding figure was 1 wasty fruit per 20 lug boxes, ranging according to the source of the oranges from 1 fruit in 6 to 1 fruit in 152 lug boxes.

Fruit graded and packed at the beginning and end of the day's work at Zebediela showed, respectively, 7 and 15 per cent. waste 21 days after arrival in England, this difference being attributed to increased contamination of the plant during the day's operations. Evidence was obtained of the necessity of disinfecting lug boxes (with 2½ per cent.

formalin) before being sent to the groves to be filled. Oranges packed after 0, 5, and 10 days' wilting averaged after arrival in England, 2, 3, and 10 per cent. waste, respectively, demonstrating that packing without wilting was not detrimental.

Oranges dipped at Zebediela, 3, 9, and 24 hours after picking in 6·8 per cent. borax [ibid., xv, p. 292] solution for 1 minute at 100° to 110° F., showed, 14 days later, 0, 0·3, and 0·2 per cent. infection, as against 0·6, 0·9, and 0·5 per cent. for the controls. In fruit-washing tests with injured and inoculated fruit at Grahamstown the best results were given by 1 minute's immersion in 8 per cent. borax and the next best by similar treatment with 2 per cent. caustic soda, the figures being, respectively, 8 and 25 per cent. waste for fruits washed 72 hours after being injured and 6 and 22 per cent. in another experiment with oranges washed within an hour or two of being inoculated. When oranges before dispatch to England were washed in 1 per cent. caustic soda for 3 minutes at 95° to 100°, only 18 per cent. waste developed, as compared with 33 per cent. in the untreated controls. At temperatures of 125° to 130°, 4 per cent. sodium carbonate and 4 per cent. borax gave 55 and 56 per cent. waste, respectively, but at 40° to 110°, sodium bicarbonate was more effective than borax.

SMITH (F. E. V.). **Wither-tip or anthracnose disease of Citrus trees.**—*J. Jamaica agric. Soc.*, xl, 1, pp. 50–52, 1936.

Citrus wither-tip or anthracnose, always present in many parts of Jamaica, was prevalent in 1935 in the Linstead District of St. Catherine. The fungus most commonly associated with the trouble is *Colletotrichum gloeosporioides* [*R.A.M.*, xiv, p. 755; xv, p. 136], but in some cases *Diplodia natalensis* and *Phomopsis* [*Diaporthe*] *citri* also occur. *C. gloeosporioides* under certain circumstances produces a stem-end fruit rot, but the fungus is not a vigorous parasite and is injurious only to weakened plants; in fact wither-tip frequently develops without any fungus at all being present in the early stages. The wither-tip symptoms are usually commonest in young budded trees one to five years old. Trees of this age frequently show a lack of balance between the root stock and scion, and this generally results in a coarse, sappy growth, readily susceptible to wither-tip. The condition is frequent on heavy, ill-drained soils and on over-manured plants. It is most prevalent in autumn, when the seasonal rains begin. In most cases, provided the plant is carefully looked after and not over-nourished, the disease disappears completely when the tree is five or six years old and the root stock and scion have become more balanced. Improved cultural practices are recommended for purposes of control.

TOXOPEUS (H. J.). **Die Züchtung von Unterlagen für Citrus sinensis Osb. immun gegen Phytophthora parasitica, die Ursache der 'gum-disease' in Java.** [The breeding of stocks for *Citrus sinensis* Osb. immune from *Phytophthora parasitica*, the agent of 'gum disease' in Java.]—*Züchter*, viii, 1, pp. 1–10, 1 fig., 1 diag., 1 graph, 1936.

A tabulated account is given of the writer's experiments in Java in the breeding of stocks for sweet oranges (*Citrus sinensis*) immune from *Phytophthora parasitica* [*R.A.M.*, xiv, p. 301; xv, p. 213], the work on

which, however, was greatly complicated by the phenomenon of polyembrony and by lack of vigour of the hybrids raised.

Inoculation tests were first made by inserting mycelium of the fungus through holes in the bark; the organism grew in the cortical tissues of the immune *nobilis* varieties, though less rapidly than in those of the susceptible kinds [ibid., x, p. 98]. This method, however, is unsuitable for the determination of individual reaction to *P. parasitica*, and inoculations by means of zoospores resulted in only 3 per cent. infection even on susceptible varieties. An attempt was then made to increase the extent of infection occurring under natural conditions by the inoculation of the soil surrounding the stem bases. During the four years since the commencement of this experiment there have been no cases of gummosis among the grafted trees, but it is pointed out that a period of six to eight years must elapse before the final trials for immunity with promising material can be undertaken. Several of the hybrids from crosses made in 1929, however, have already contracted the disease (*C. hybridus* × *C. sinensis*, *C. hybridus* × *C. nobilis*, and *C. hybridus* × *C. aurantium*), denoting the possibility that immunity among F_1 stocks is not to be anticipated, and that further tests in the F_2 are requisite.

REED (H. S.) & FRÉMONT (T[HÉRÈSE]). **Étude physiologique de la cellule à mycorrhizes dans les racines de Citrus.** [A physiological study of the mycorrhiza cell in Citrus roots.]—*Rev. Cytol. et Cytophysiol. vég.*, i, 4, pp. 327–348, 8 figs., 1935.

Further studies in California of the mycorrhizal infection of citrus trees [*R.A.M.*, xv, p. 90] showed that affected roots contain abnormal amounts of starch in the uninfected cells. This becomes apparent immediately the roots are infected, even in cells far removed from those affected. Directly, however, the mycelium enters a cell all trace of starch disappears.

Lipoidal precipitates are constantly present in the mycelium and in infected and uninfected root cells, but mostly in the superficial layers of the cortex, where infection seldom occurs. All pathological conditions apparently favour the development of these precipitates, and possibly the presence of the endophyte may sometimes be a remote cause of their development, while in some cases a fatty degeneration of the mycelium may liberate large amounts of fat in the cell; this was observed in roots kept in the laboratory. Oxidase was found to be more abundant in infected than in non-infected plants.

It is concluded that in citrus roots the mycorrhiza cell is essentially an unstable association. The resistance or susceptibility of the host cell depends on soil fertility, type of fertilizer, irrigation, and weather conditions, and the more lasting and more well-balanced the association the more effective it is from the point of view of plant nutrition. As the fungus is invariably eliminated sooner or later the mycorrhizal cell is an example of a resistance that develops after a state of extreme susceptibility.

MITRA (M.) & KHESWALLA (K. F.). **The effect of temperature on the growth of Fusarium vasinfectum Atk.**—*Proc. Indian Acad. Sci.*, ii, 6, pp. 495–499, 1 graph, 1935.

A study on the influence of temperature on the growth of monospore

cultures of the cotton wilt strain of *Fusarium vasinfectum* [*R.A.M.*, xiv, p. 358] isolated at Dharwar showed that the optimum temperature for growth on solid and liquid media is about 25° C., the minimum a little below 13° to 14°, and the maximum apparently between 35° and 40°.

AFZAL (M.), JAGGI (S. S.), & SINGH (B.). **A note on a survey of the disease of malformation in the Punjab-American Cottons.**—*Indian J. agric. Sci.*, v, 5, pp. 624–631, 1935.

In a survey of all the important cotton-growing areas of the Punjab it was found that while the disease tentatively identified as stenosis [*R.A.M.*, xiii, p. 438; xiv, p. 561] is serious in the neighbourhood of the Punjab Agricultural College Estate, it is of no consequence in the other parts of the province. The type of soil seemed to exert a remarkable effect on the disease in one experiment, the varieties L.S.S., 38 F, and 45 F showing 20·26, 20·16, and 20·61 per cent. infection, respectively, on rich land, and 3·02, 4·92, and 4·92 per cent. on light land. Seed from small-sized bolls on affected plants failed to transmit the disease to the progeny.

DÓSA (A.). **Über das Trichophyton gypseum persicolor an Hand von 'Herpes tonsurans' und 'Eksema dysidroticum'—Fällen.** [On *Trichophyton gypseum persicolor* accompanying cases of 'herpes tonsurans' and 'eczema dysidroticum'.]—*Arch. Derm. Syph., Berl.*, clxxiii, 4, pp. 385–387, 2 figs., 1936.

Trichophyton gypseum persicolor [*T. persicolor*: *R.A.M.*, xv, p. 296] was recently isolated from two patients at the Clinic for Skin Diseases, Franz Josef University, Szeged (Hungary), and formed on maltose agar oval, angular, stellate, or irregular, furcate colonies, sometimes with serrated margins, with a protuberant, butter-yellow centre merging into mauve or peach-colour towards the periphery, near which a dark, concentric stripe developed after the third week. Striking modifications of these characters were apparent in subcultures. In hanging drops few free conidia were observed and these organs were also only sparsely formed, sometimes in botryose clusters, on the sides of the frequently curved hyphae of variable diameter; numerous plurilocular spindles were detected, however, together with aggregations of arthrospores. The patients reacted positively to injections with trichophytin vaccines. The fungus was not highly pathogenic, inoculations on guinea-pigs giving negative results, and cures were readily effected by appropriate treatments.

DAVIDSON (A. M.), BOYD (S. A.), & HALTALIN (C. P.). **An improved source of ultra-violet light for the diagnosis of ringworm of the scalp.**—*Canad. med. Ass. J.*, xxxiii, pp. 534–536, 1 fig., 1 diag., 1935.

Technical details are given of certain improvements made in the portable lamp produced in 1932 by Davidson and Gregory as a source of 'Wood's light' for the detection in human and animal hair of organisms becoming fluorescent on exposure to filtered ultra-violet rays, e.g., *Microsporon audouini*, *M. lanosum*, and *Achorion schoenleini* [*R.A.M.*, xii, p. 23]. The modifications in question are stated to have resulted

in an inexpensive and convenient apparatus of considerable diagnostic utility.

DE MELLO (F.) & MASCARENHAS (J.). **Levures et levuroses.** [Yeasts and diseases caused by them.]—*Arch. Esc. med.-cirurg. Nova Goa*, Ser. A, 10, pp. 1945–2032, 1935.

In the first part of this paper the authors, after referring to the difficulty of distinguishing adequately between true yeasts and yeast-like forms, summarize in considerable detail the information given by Guilliermond in his work 'Les levures' [Paris, 1912] on the biological problems related to these organisms.

In the second part [by de Mello] a full account is given, with numerous citations from the relevant literature, of the conflicting views of medical mycologists as to the status of many of the genera to which yeasts and yeast forms are referred. From a review of the evidence [which is discussed in detail] the author accepts the following genera as valid (1) *Candida* Berkhout, including most species of *Monilia* and some species of *Cryptococcus* [*R.A.M.*, viii, p. 676; xiii, p. 767; xv, p. 96]; (2) *Geotrichum* Link, emend. Cif. & Red. [ibid., xi, p. 476], which should include all those species of *Oidium* pathogenic to man, as well as *Mycoderma* sensu Vuillemin [ibid., xiii, p. 370]; (3) *Geotrichoides* Langeron & Talice [ibid., xiii, p. 767] for those forms with characters intermediate between the creamy colonies characteristic of *Monilia* [*Candida*] and the membranous ones characteristic of *Geotrichum*; (4) *Torulopsis* Berlese 1894, for *Torula* sensu Turpin, Pasteur, and Hansen [ibid., xiv, p. 192]; and (5) *Klöckera* Janke 1923 (identical with *Pseudosaccharomyces* Klöcker, 1912, rejected as a homonym) [ibid., xiv, p. 193], including the apiculate, asporogenous yeasts. No opinion is expressed as to the validity of the genus *Coccidioides*. The following are rejected: (1) *Monilia* Gmelin, because this designation should be restricted to fungi found on plants; (2) *Cryptococcus*, because it has been applied in so many different senses that it is responsible for most of the confusion in which the study of yeasts is involved; (3) *Blastodendrion* [ibid., xiii, pp. 370, 767] and *Mycelorrhyzodes*, because they are incompletely characterized and the distinction drawn by their author between mycelium and pseudomycelium is too unreliable to serve as a basis for a generic classification; (4) *Oidium* Link, a term which should not be used in medical mycology, as the type species *O. monilioides* differs from *O. lactis* with the result that the medical sense given to the genus by Vuillemin, Pinoy, and others is quite different from the original phytopathological one; (5) *Torula* Pers., because it is used for *T. monilis*, a Dematiaceous fungus, and cannot be employed sensu Turpin, Pasteur, and Hansen. Ciferri's and Redaelli's classification, being based on occasionally inconstant characters, is not accepted in its entirety. *Blastomycoides* Cast. is rejected because it is synonymous with older, incomplete, and badly characterized genera, and is based on imperfect botanical characters and tissue changes in the host. Langeron's and Talice's classification [ibid., xi, p. 476] introduces specific characters into a generic definition, and the new genera established by them (*Mycocandida* and *Mycotoruloides*) are therefore rejected, the same observation applying to *Neogeotrichum* Magalhães.

In the third section of the paper [by de Mello and collaborators] the authors give a concise classification of the diseases of man caused by yeasts, arranged according to the site of infection. Details are given of a species of *Geotrichum* (No. 1) isolated from a case of intertrigo, and a number of unidentified species of *Candidà*, No. 1 isolated from multiple, verrucose, or pustular ulceration of the leg, Nos. 2 to 9 associated with bronchial disease, Nos. 10 and 11 associated with enteritis and two (unnumbered) from two pulmonary cases.

Dodge (C. W.). **Medical mycology. Fungus diseases of men and other mammals.**—900 pp., 142 figs., London, H. Kimpton, 1936. Price £2 2*s*. net.

For the first time, the whole of the literature dealing with medical fungi up to the end of 1933 has been brought together into one book. The bibliography, which cites probably more than 4,000 titles, occupies some 167 pages, and the author has made a point of checking the dates of publication of all the papers which contain valid publication of new genera, new species, and new combinations. The book opens with short chapters on the morphology and physiology of fungi, culture media, and methods of isolation, and then one on botanical nomenclature as governed by the international rules; as the rules and recommendations passed in 1930 were not published in time, use has been made of an unofficial version.

The systematic account starts with the Mucorales; *Mucor*, *Absidia*, *Rhizopus*, and *Mortierella*. A brief chapter (viii) introduces the reader to the Ascomycetes, considered mainly in reference to their cytology, while Chapters ix to xiv are devoted to the Endomycetales, the classification followed being apparently an elaboration of that presented in Gäumann's and Dodge's 'Comparative Morphology of Fungi' [*R.A.M.*, vii, p. 591]. Chapter xi, under the title Eremascaceae Imperfectae, includes a considerable number of genera which the author anticipates will finally be proved to belong to the Eremascaceae. *Candida* Berkhout, to which the author refers *Geotrichoides* Langeron and Talice, comes here together with its numerous associates and derivatives: *Monilia* (attributed to Bonorden) is also included, and the *Monilia* species of the plant pathologists are accordingly excluded from the genus [see preceding abstract]. Chapter xii reviews the Saccharomycetaceae and Chapter xiii the Saccharomycetaceae Imperfectae. Chapter xiv is devoted to the genus *Malassezia* and the bibliography of all the Endomycetales; unfortunately the printer has attributed all the literature to the single genus. Chapter xv introduces the Plectascales and the family Gymnoascaceae, and xvi the Trichophytoneae, which are considered by the author to be probably imperfect stages of the Gymnoasceae. This last group, which includes the common ringworm fungi, comprises the genera *Trichophyton*, *Microsporon*, *Achorion*, *Epidermophyton*, *Endodermophyton*, *Pinoyella*, *Ectotrichophyton*, *Megatrichophyton*, and *Favotrichophyton*. Chapter xvii is devoted to the Aspergillaceae (*Aspergillus*, *Penicillium*, &c.). Among the general Fungi Imperfecti, included at the end of the book, may be noted the Toruleae (Chapter xix), the Actinomyceteae (Chapter xx) and the Sporotricheae (Chapter xxi).

The book is a mine of information about these highly contentious organisms, and will be quite indispensable to all workers who have to deal with them.

OLEYNIKOVA (Mme V. M.). Болезни Льна основных льноводных районов Восточносибирского края. [Flax diseases in the principal Flax-growing regions of East Siberia.]—*Тр. Защ. Раст. вост. Сибири* [*Bull. Pl. Prot. East Siberia*], 2(4), pp. 289–305, 1 graph, 1935.

After referring to the rapid development of flax-growing in East Siberia as an industry, the author gives an annotated list of the pathogenic and semi-parasitic fungi (16 species) which she found on flax in that country during a preliminary survey in 1932. Subsequent observations showed that of these organisms *Colletotrichum lini* [*R.A.M.*, xiv, p. 763] alone causes important annual losses (estimated on the average at 30 per cent. of the crop); its incidence all over the country ranges between 60 and 100 per cent. of the flax stands, fields with 85 to 95 per cent. infection being the general rule. The fungus was found attacking the host at all the stages of its development, from the emergence of the cotyledons upwards, and it caused serious deterioration of the textile qualities of the fibres. Rust (*Melampsora lini*) [ibid., xiv, p. 309] is stated to have been introduced from Russia proper with flax seed, but so far it has not been observed to cause considerable damage to the local flax varieties, though in 1933, a year very favourable to fungal diseases, it was recorded from many localities, and its further development in the country should be carefully watched, because of its potentialities. Among other diseases of minor local importance mention may be made of wilt (*Fusarium lini*) [ibid., xiv, p. 763], browning or stem-break (*Polyspora lini*) [ibid., xv, p. 158], and those caused by *Ascochyta linicola* [ibid., xi, p. 647], *Botrytis cinerea* [ibid., xii, p. 372], *Mycosphaerella linicola* [ibid., vii, p. 446], *Erysiphe cichoracearum* [ibid., xiii, p. 515], and *Helminthosporium linicola* [ibid., ix, p. 720], of which the two first-named deserve further study. While *F. lini* only appeared to attack flax plants debilitated by other causes, a serious seedling blight, chiefly characterized by a rapidly developing girdling of the stem at soil level, resulting in the plant falling over at that point and dying in one or two days, was observed in some localities to be caused by a species of *Fusarium* differing morphologically from *F. lini*; this organism is now being studied.

In varietal disease resistance tests none of the local varieties of flax tried was wholly resistant to *C. lini*, but the six varieties 1191, 8233, 0266, 0258, 1125, and Alpha, showed only a relatively low degree of susceptibility; these varieties, however, were all highly susceptible to rust, while the varieties resistant to the rust were all highly susceptible to *C. lini*.

BAUDYŠ (E.). **Nejdůležitější choroby a škůdci Jiřín.** [The more important diseases and pests of Dahlia.]—*Publ. fytopath. Sekce zemsk. výzk. Ust. zeměd. Brno* [*Publ. phytopath. Sect. reg. agric. Exp. Sta. Brno*] 149, 7 pp., 7 figs., [?] 1935. [Received February, 1936.]

This is a brief, popular account of the more important pests and diseases of dahlia so far recorded from Czecho-Slovakia, among

which the following cause the greatest damage to the growing plant: damping-off of seedlings and young cuttings (due to a number of fungi including *Phytophthora omnivora*, *Thielavia basicola*, *Moniliopsis aderholdi*, and *Rhizoctonia* [*Corticium*] *solani*), crown gall (*Pseudomonas* [*Bacterium*] *tumefaciens*) [*R.A.M.*, xiii, p. 517], *Verticillium dahliae* [ibid., xii, p. 26; xv, p. 99], wilt (due to various species of *Fusarium*, especially *F. roseum* and *F. georginae* [cited by Wollenweber as synonymous with *Colletotrichum atramentarium*]), *Sclerotinia sclerotiorum* [ibid., iii, p. 40], and *Botrytis cinerea* [ibid., xii, p. 25] which rapidly rots the inflorescences under humid conditions. Other records are *Entyloma dahliae* [ibid., xiii, p. 655], first introduced into Moravia in 1926, *Erysiphe communis* [*E. polygoni* sensu Salmon], *Phyllosticta dahliaecola*, and *Cercospora grandissima* [ibid., xiv, p. 472], the last-named of which was imported into the country from Brazil. Stored tubers are attacked by a number of fungi, including several species of *Fusarium* and *Acrostalagmus cinnabarinus*. Control measures are briefly indicated in every case.

Elssmann (E.). **Der Löwenmaulrost und die ungelöste Frage seiner Bekämpfung.** [Snapdragon rust and the unsolved problem of its control.]—*Blumen u. PflBau ver. Gartenwelt*, xl, 3, pp. 30–31, 2 figs., 1936.

According to Poeverlein (in correspondence) the rust of *Antirrhinum majus* (*Puccinia antirrhini*) [see next abstracts] continued to spread widely in Germany in 1935, when it travelled eastwards through Silesia to Czecho-Slovakia, the spores being presumably disseminated by wind. The seed of *A. majus* has been found to be extremely sensitive to liquid disinfectants, half-an-hour's immersion in 0·25 per cent. uspulun or ceresan causing a serious reduction of germination which did not follow the use of ceresan or abavit B dusts.

Andres (H.). **Der Antirrhinum-Rost (Puccinia antirrhini Diet. et Holw.) in Westdeutschland. II.** [The *Antirrhinum* rust (*Puccinia antirrhini* Diet. & Holw.) in western Germany. II.]—*Ann. mycol., Berl.*, xxxiii, 5–6, pp. 353–356, 1935.

The writer gives further details of the intensely severe outbreak of *Antirrhinum* [*majus*] rust (*Puccinia antirrhini*) previously reported in western Germany [*R.A.M.*, xiv, p. 364; xv, p. 227], the origin of which is entirely obscure and likely to remain so. No sign of seed or corolla infection has so far been observed, nor is any evidence forthcoming that the rust is heteroecious. The fungus behaves very capriciously, now appearing to prefer the red varieties and at other times the white ones [cf. next abstract], while its mode of spread is also eccentric. It survives severe frosts and is apparently unaffected by burning sunshine, gales, and the like. Variations in teleutospore characters as determined by Prof. Dietel [loc. cit.] are given for material from four localities, including Grignon (France) [ibid., xiii, p. 269].

Buchwald (N. F.). **Løvemundsorternes Modtagelighed for Rust (Puccinia antirrhini).** [Varietal susceptibility of Snapdragons to rust (*Puccinia antirrhini*).]—*Gartnertidende*, *1936*, 4, pp. 45–49, 3 figs., 1936.

A tabulated account is given of the writer's investigations in seven

localities of Denmark [*R.A.M.*, xiv, p. 239], including Copenhagen and its environs, of the susceptibility of varieties of *Antirrhinum majus* (arranged in seven groups) to *Puccinia antirrhini* [see preceding and next abstracts]. Broadly speaking, the majority of the yellow- and white-flowered varieties, e.g., Gold Monarch, Giant Yellow, Queen of the North, and Pure White, are fairly resistant to rust, the percentages of slightly susceptible types within the two categories being 60 and nearly 90, respectively [ibid., xiii, p. 704; xiv, p. 172]. The pink, red (various shades), and variegated classes, on the other hand, tend to a higher degree of susceptibility, the percentages of moderately resistant sorts within them being only 36, 30, and 23, respectively.

STEINER (H.). **Der Löwenmaulrost (Puccinia antirrhini) auch in Österreich.** [The Snapdragon rust (*Puccinia antirrhini*) also in Austria.]—Reprinted from *Gartenztg, 1936*, 2 pp., 4 figs., 1936.

In connexion with the recent (November, 1935) detection of snapdragon (*Antirrhinum*) [*majus*] rust (*Puccinia antirrhini*) [see preceding abstracts] in some Viennese nursery-gardens, the writer gives a semi-popular account of the distribution, etiology, and symptoms of the disease, with indications for its control based on the experience of workers on the same problem in other countries.

GALLOWAY (L. D.) & SEN (R. R.). **An unusual rust fungus on Tulip.**—*Indian J. agric. Sci.*, v, 6, pp. 743–744, 1 pl., 1935.

The authors record the occurrence of *Puccinia prostii* on a leaf of *Tulipa* sp. received from Baluchistan in May, 1935. The very characteristic spiny teleutospores measured 44 to 66 by 30 to 46 μ.

FLACHS (K.). **Krankheiten and Schädlinge an Kakteen.** [Cactus diseases and pests.]—*Nachr. SchädlBekämpf., Leverkusen*, x, 4, pp. 184–193, 13 figs., 1935. [English summary.]

Semi-popular notes are given on the following diseases of Cactaceae: *Phytophthora cactorum*, the agent of wet or black rot, chiefly of *Cereus* and *Melocactus* spp. in Germany [*R.A.M.*, vii, p. 581; xi, p. 651] (controllable, when recognized in the incipient stage, by excision of the infected parts and disinfection with a 0·25 per cent. solution of uspulun or ceresan); *Helminthosporium cactivorum* [ibid., x, p. 798], which attacks *Cereus*, *Echinocactus*, and *Mamillaria* spp., and was found by the writer severely infecting young plants from Mexico in 1933; *Botrytis cinerea*, affecting the same species and *Opuntia* (amenable to spraying with 2 per cent. Bordeaux mixture or soft soap); and *Moniliopsis aderholdi* [ibid., xii, pp. 97, 448] on seedlings and cuttings (for the control of which soil disinfection with ceresan or uspulun and repeated spraying of the plants with 1 per cent. copper sulphate are recommended in addition to appropriate cultural measures). *O.* spp. are also subject to invasion by *Sclerotium cacticola* (in Holland) [ibid., xii, p. 634]; *Bacillus cacticidus* [ibid., v, p. 304]; *Pseudomonas* [*Bacterium*] *tumefaciens* [ibid., xiv, p. 39]; *Gloeosporium opuntiae* (in the United States); *Phyllosticta opuntiae* (in Italy); and scab caused by a species of *Melanops*, *Botryodiplodia*, or *Dothiorella* (on *O. diademata* var. *papyracantha* in Czecho-Slovakia) [ibid., x, p. 799]. *Pythium de Baryanum* occurred on

young *Cereus* plants in Italy in 1931. Other diseases of minor importance include *G. cerei* on *Cereus*, *G. cactorum* on *Mamillaria*, *Septoria cacticola* and *Phoma cereicola* on *Cereus*, and *P. melocacticola* on *Melocactus*. Pape has reported mosaic on cactus in Germany [ibid., xii, p. 570], where the plants also occasionally suffer from physiological disturbances, e.g., 'corkiness', manifested by green or rusty-yellow spots on the leaves, and chlorosis, in which yellow or brownish-green shoots replace those of a normal colour.

NICOLAS (G.). **Phillyrea media L. et Zaghouania phillyreae Pat.** [*Phillyrea media* L. and *Zaghouania phillyreae* Pat.]—*Bull. Soc. Hist. nat. Afr. N.*, xxvi bis, pp. 45–47, 1935.

In further studies made on *Zaghouania phillyreae* [*R.A.M.*, xiii, p. 717] on *Phillyrea media*, in Toulouse, the author observed that tumours produced by the fungus on the branches showed the presence of uredosori frequently covered with mycelium bearing white, elongated, slightly arched conidia tapering at the extremities, containing four (occasionally up to seven) cells, and measuring 29 to 33 by 2·8 to 3 μ. Some of the uredospores were discoloured and deformed and the white mycelium, which is probably parasitic, is thought to belong to *Fusarium uredinicolum*.

SERVAZZI (O.). **Uropyxis sanguinea (Peck.) Arth., la ruggine americana della Mahonia in Italia.** [*Uropyxis sanguinea* (Peck.) Arth., the American *Mahonia* rust in Italy.]—*Difesa Piante*, xii, 6, pp. 189–191, 1 pl., 1935.

In June, 1933, the author observed at Biella *Mahonia* [*Berberis*] *aquifolium* showing heavy infection by *Uropyxis* [*Cumminsiella*] *sanguinea* [*R.A.M.*, xv, p. 230], not previously recorded in Italy. The abundant uredospores measured 25 to 33 by 16 to 19 μ, and the teleutospores, produced in limited numbers, 30 to 35 by 18 to 20 μ with a pedicel 100 to 165 by 3 to 4 μ. No aecidia were observed. The fungus was subsequently observed in Turin and Chieri, and the author considers that it is probably widely prevalent in northern Italy.

KLINKOWSKI (M.). **Schädlinge und Krankheitserscheinungen der Serradella.** [Pests and disease phenomena of Serradella.]—*Mitt. Landw., Berl.*, li, 1, pp. 12–13, 4 figs., 1936.

Serradella [*Ornithopus sativus*] in Germany is stated to be liable to a wilt disease caused by a species of *Fusarium*, a root rot due to *Rhizoctonia*, and chlorosis resulting from soil acidity [*R.A.M.*, iv, p. 603; cf. also xiv, p. 255], the last-named being the most important and necessitating treatment by timely applications of lime in appropriate amounts to induce a reaction of P_H 5·8 to 6·8, the optimum for the growth of the crop.

BAUDYŠ (E.). **Škody způsobené chorobami a škůdci na pícních rostlinách a jak jim čeliti.** [Damage caused by diseases and pests to fodder plants and how to control them.]—*Publ. fytopath. Sekce zemsk. výzk. Ust. zeměd. Brno* [*Publ. phytopath. Sect. reg. agric. Exp. Sta. Brno*] 152, 6 pp., 1935.

This paper gives brief practical instructions for the control of the

most important bacterial and fungal diseases (and also insect pests) which attack a wide range of crops grown for fodder in Czecho-Slovakia (including maize, sorghum, *Panicum miliaceum*, peas, broad beans (*Vicia faba*), vetch, lupins, clovers, lucerne, swedes, turnip, and fodder beet). In the author's opinion many of the diseases might be prevented altogether or considerably diminished by disinfecting the seed before sowing, and the best preparations for this purpose are indicated, together with the proper doses and time of treatment. The use of home-grown seed is strongly recommended, in view of its commercial production being under State phytosanitary control. Spraying with Bordeaux mixture is recommended against the downy mildews of clover (*Peronospora trifolii hybridi* and other species) [*R.A.M.*, xiv, p. 241], lucerne (*P. aestivalis*) [*P. trifoliorum*: loc. cit., ibid., xi, p. 304], fodder beet (*P. schachtii*) [ibid., xv, p. 193], and other fodders, and against *Cercospora beticola* [ibid., xv, p. 285] on beet. Clover and meadow grasses grown for seed should be sprayed with lime-sulphur against *Erysiphe communis* [*E. polygoni*] and *E. graminis*, respectively [ibid., xiv, p. 572].

SCHANDER (H.). **Ein Beitrag zur Physiologie der 'Kalkchlorose' der Lupine.** [A contribution to the physiology of 'lime-induced chlorosis' of the Lupin.]—*Ber. dtsch. bot. Ges.*, liii, 9, pp. 807–810, 1935.

Particulars are given of the writer's investigations at the Kaiser Wilhelm Plant Breeding Institute, Müncheberg, Mark Brandenburg, on lime-induced chlorosis of lupins (especially *Lupinus luteus*, *L. angustifolius* being relatively insensitive to this type of injury) [*R.A.M.*, xv, p. 298]. It would appear from the data here presented that the disturbance arises only where the soil is excessively alkaline in the zone in immediate contact with the roots, and that the detrimental reaction may be adjusted in favour of the plants by means of their own root secretions provided the physical characters of the soil are reasonably propitious.

PASINETTI (L.) & AGUSTONI (ENRICA). **Studio sulla definizione dei prodotti orto-frutticoli di scarto in rapporto a criteri fisiologici, fitopatologici e fitomerceologici.** [A study of the definition of unsaleableness in market-garden produce in relation to physiological, phytopathological, and phyto-commercial criteria.]—*Nuovi Ann. Agric., Roma*, xv, 4, pp. 561–684, 34 figs., 1935.

In this study of the standardization of fruit and vegetables carried out over a period of more than seven years at the Milan market and elsewhere, as well as in the laboratory, the authors specify the various grounds on which each kind of fruit or vegetable may be regarded as unfit for sale, and in each case give notes on the moulds and common fungal and other diseases liable to bring the produce into this category.

SHAW (L.). **Intercellular humidity in relation to fire-blight susceptibility in Apple and Pear.**—*Mem. Cornell agric. Exp. Sta.* 181, 40 pp., 3 figs., 8 graphs, 1935.

In these studies, a preliminary account of which has already been

noticed [*R.A.M.*, xiii, p. 451], the growth rate of the fireblight organism (*Erwinia amylovora*) [*Bacillus amylovorus*: ibid., xiv., p. 744] was tested in liquid culture with humidity equivalents produced by varying the concentrations of dextrose, levulose, sucrose, and maltose. Maximum growth occurred at 99·9 per cent. humidity equivalent; at 99·5, 99, and 98·5 per cent. growth was reduced to $\frac{3}{5}$, $\frac{1}{5}$, and $\frac{1}{10}$ of the maximum respectively, while at 98 per cent. only occasional very slight growth developed. In tests on solid media with relative humidities established over sulphuric acid solutions, the maximum growth was again at 99·9 per cent., reduced at 99 per cent. to $\frac{1}{3}$, at 98 per cent. to $\frac{1}{20}$, at 97 per cent. to a very slight growth or none, while at 96 per cent. no growth occurred. Pear fruits (Kieffer) and cut shoots (average of results on Kieffer and Bartlett) in equilibrium with different relative humidities showed maximum susceptibility at 100 per cent. relative humidity; at 99 and 98 per cent. susceptibility was, respectively, approximately $\frac{1}{6}$ and $\frac{1}{10}$ of the maximum, at 97 per cent. only very slight disease development occurred in a few cases, and at 96 and 95 per cent. no disease appeared.

A method is described for measuring the relative humidity in the intercellular spaces of living tissues, based on the turgor deficit of the plant cells. A table is given with the aid of which turgor-deficit values can be converted to equivalent relative humidities. Measurements on the above-mentioned shoots showed a relatively close agreement between the intercellular humidities and the humidities in the test chambers.

Potted pears (Kieffer and Bartlett) and apples (McIntosh and Delicious) at different atmospheric humidities and different soil moistures showed high susceptibility and high intercellular humidity when the moisture content of the environment was high, and vice versa. When the average intercellular humidity was between 97 and 98·5 per cent. the plants were completely resistant or only slightly susceptible, while when it was above 99·5 per cent. they were highly susceptible. Plants with intermediate intercellular humidities were intermediate in their degree of susceptibility.

Preliminary measurements on orchard trees showed significant daily variations in intercellular relative humidity, which was usually somewhat higher in Bartlett than in Kieffer pears, and in Yellow Transparent than in McIntosh apples.

It is concluded that intercellular humidity has a definite influence on fireblight susceptibility in apples and pears and is probably the main factor causing differences of susceptibility in comparable groups of plants in environments differing in the amount of moisture present.

Nose (T.). **A bark disease of Apple.**—*Ann. agric. Exp. Sta. Chosen*, vii, pp. 405–414, 2 pl., 1934. (Japanese.) [Abs. in *Jap. J. Bot.*, viii, 1, p. (21), 1936.]

Physalospora piricola, which is responsible for a severe and widespread disease of apple branches, leaves, and fruits (brown or grey, coalescent lesions) in Korea [*R.A.M.*, xiv, p. 640], was shown by cultural experiments to comprise three distinct strains.

HOLZ (W.). **Beobachtungen über Primärinfektionen durch Askosporen des Apfelschorferregers [Fusicladium dendriticum (Wallr.) Fckl.].** [Observations on primary infections by ascospores of the Apple scab agent (*Fusicladium dendriticum* (Wallr.) Fckl.)]—*Zbl. Bakt.*, Abt. 2, xciii, 13–17, pp. 290–295, 2 figs., 1936.

An examination in Berlin of 50 apple leaves boiled in potash lye revealed the constant presence in the centres of 264 so-called 'mycelial stars' (stellate thalli composed of a flat, pseudo-parenchymatous central mass whence branched hyphae radiate in all directions) of ascospores of the scab fungus (*Fusicladium dendriticum*) [*Venturia inaequalis*: *R.A.M.*, xv, p. 29], conidia being uniformly absent. These data are considered to substantiate the observations of American and European workers as to the primary importance of the ascospores in the initiation of scab epidemics [ibid., xiv, pp. 589, 590].

HILITZER (A.). **Vliv strupovitosti na transpiraci Jablek.** [The influence of scab on the transpiration of Apples.]—*Ann. Acad. tchécosl. Agric.*, x, 5, pp. 616–621, 1 graph, 1935. [French summary.]

In the experiments briefly reported in this paper the author compared the daily loss in water under ordinary room conditions of normal apples with that of exactly comparable apples affected with scab (*Venturia inaequalis*), in relation to the final constant dry weight of the fruits. The results showed that the scabbed apples transpired considerably more (up to $3\frac{1}{2}$ times as much) than healthy ones, the intensity of transpiration increasing with the size, the scabbed surface, and depth of cracks in the surface of the diseased fruits. Rotted and wormy apples, on the other hand, did not transpire appreciably more than healthy ones.

HILITZER (A.). **Vliv strupovitosti na transpiraci Hrušek.** [The influence of scab on the transpiration of Pears.]—*Ann. Acad. tchécosl. Agric.*, xi, 1, pp. 118–121, 1936. [French summary.]

By methods similar to those used for scabbed apples [see preceding abstract], the author established that pear fruits heavily attacked by scab (*Venturia pirina*) always contain less water than sound ones, but not if only slightly affected. In both cases, however, the diseased fruits transpire considerably more (sometimes 20 times as much) than the normal, but no direct correlation was found between intensity of transpiration and size of fruit; usually, however, the increased transpiration of scabbed pears is relatively less than that of scabbed apples, this being attributed to the better developed cuticle in apples than in pears. Wormy pears do not transpire significantly more than the healthy.

MILLER (P. W.). **A report of progress on studies of Prune russet ('scab') and its control.**—*Rep. Ore. St. hort. Soc., 1935*, pp. 105–122, 3 figs., 1 graph, 1936.

French and Italian prunes in Oregon and Washington are stated to suffer heavy damage from the disorder known as 'russet' or 'scab', which is widely distributed throughout the Pacific Northwest and may affect up to 75 per cent. of the crop; in 1935 the estimated incidence of the disease was 20 per cent. in Oregon and 10 in western Washington.

The fruit is disfigured by scattered, superficial, scurfy, yellowish-brown spots of varying shape and size, sometimes extending over three-quarters of the surface. The injury occurs relatively early in the season (beginning of May to early June), i.e., for about a month from the fall of the old calyces. Negative evidence having been obtained in attempts to isolate a pathogen from the diseased plums, the condition under observation may be definitely considered non-parasitic and probably largely due to mechanical abrasions of the young fruit by contact with twigs and branches during periods of high wind.

Baudyš (E.). **Nejdůležitější choroby a škůdci Meruňky a Broskvoně a ochrana proti nim.** [The most important diseases and pests of the Apricot and Peach, and their control.]—*Publ. fytopath. Sekce zemsk. výzk. Ust. zeměd.* [*Publ. phytopath. Sect. prov. agric. Exp. Sta.*] 147, Židlochovice, 55 pp., 60 figs., 1935.

This is a semi-popular, briefly annotated list of the more important physiological, bacterial, fungal, and virus diseases, and also pests, which are known to attack the apricot and peach in Czecho-Slovakia. Measures directed towards the control of the diseases are discussed rather fully in each individual case. Most of the figures illustrating this paper appear to be original.

Jones (L. K.) & Baur (K. E.). **Mosaic and related diseases of Raspberries in Washington.**—*Bull. Wash. St. agric. Exp. Sta.* 324, 19 pp., 9 figs., 1 map, 1936.

Virus diseases are stated to constitute a limiting factor in raspberry cultivation in the central and eastern United States [*R.A.M.*, xiv, p. 642] and to have caused serious losses in some of the Washington plantings [ibid., xii, p. 204], where mosaic is widespread and destructive, especially in the east. Yellow mosaic [see next abstract], leaf curl, and streak [ibid., xv, p. 163] are of minor importance. The crop is further affected by a physiological mottling in the shape of small, pale areas, scattered through the normal green tissue of fruiting canes and the older leaves of new ones; this disorder, which fluctuates from one season to the next, has no economic significance. Another condition liable to confusion with mosaic is a partial or subtotal chlorosis of the interveinal tissue of fruiting canes due to a disturbance in the metabolism of the plant.

The results of field observations showed that mosaic spreads more rapidly on black [*Rubus occidentalis*] than on red raspberries, of which Cuthbert is more susceptible than Marlboro in western Washington. The disease may be eradicated or reduced to a minimum by careful roguing. Several other red varieties, including Latham and Chief, are moderately resistant to mosaic, while Lloyd George is apparently immune. The Plum Farmer and Munger black raspberries suffer heavy damage from mosaic, Cumberland and others being less susceptible.

Control measures should include, besides thorough roguing, the use of sound nursery stock; the isolation of new plantings by at least 300 ft. from infected sites; the cultivation of resistant varieties in so far as these are commercially acceptable; and measures to prevent the introduction of infective aphids (*Amphorophora rubi*, *A. sensoriata*, *A. rubi-*

cola, and *Aphis rubiphila*) into healthy plantings on pickers' clothing or on crates and boxes.

COOLEY (L. M.). **The identity of Raspberry mosaics.**—*Phytopathology*, xxvi, 1, pp. 44–56, 1 diag., 1936.

Experimental transmission trials and field observations on disease spread in western New York afforded evidence that the 'mild mosaic' universally present in Columbian hybrid (purple) raspberries (*Rubus neglectus*) [*R.A.M.*, xi, p. 381] is caused by a virus identical with that of red raspberry mosaic [see preceding abstract].

In inoculation tests with this virus on healthy Plum Farmer and Cumberland black raspberries [*R. occidentalis*], the latter developed all forms of mosaic except the yellow type [loc. cit. and ibid., vi, p. 675] in varying degrees of severity from extremely mild to intensely virulent. It would thus appear that a single virus is capable of inducing all forms of mosaic (except yellow) liable to occur in the black raspberry in the eastern United States. These indications were substantiated by field experience, which further showed that the pathogenicity of the mosaic virus to *R. occidentalis* is largely governed by environmental, climatic, and cultural conditions. These data are considered to support Rankin's conclusion that only two viruses are involved in the causation of raspberry mosaic in the region under observation, viz., red and yellow [ibid., ix, p. 394].

Discussing the nomenclature of the raspberry mosaic viruses, the writer recommends the substitution for such inappropriate and confusing terms as 'red raspberry mosaic' and 'red mosaic' of the more descriptive 'green mottle' or simply 'green' mosaic, which conveys the entire range of symptoms from very mild to highly virulent cases. No change is proposed in the usage of the name 'yellow mosaic'.

WARDLAW (C. W.). **The storage and physiology of tropical fruits.**—*Trop. Agriculture, Trin.*, xii, 12, pp. 313–319, 2 graphs, 1935.

In the first part of this paper, read before the Imperial Botanical Conference, London, in 1935, the author discusses empirical storage problems of bananas, tomatoes, avocado pears, limes, and grapefruit, while the second part is devoted to the consideration of respiration in developing, maturing, and senescent fruits. In the measurement of the respiration of fruits in storage by the usual methods a time comes when the experiment has to be discontinued on account of fungal wastage, a sharp rise in the rate of liberation of carbon dioxide being characteristic of this phase. In this connexion a special study was made on the respiration of the papaw, a fruit especially favourable for the investigation of internal gas relations. When papaws have attained a certain degree of ripeness they develop spots due to *Colletotrichum gloeosporioides* [*R.A.M.*, vi, p. 57]. This fungus, however, is not a storage pathogen properly so called, but is established as a field infection which remains dormant for a time. The spots are circular, slightly sunken, and mostly superficial, and the chief damage done is the destruction of the epidermal and subepidermal tissues. Later, the spots serve as a means of ingress of other fungi.

In 'external' respiration studies the first appearance of the spots was

found to be accompanied by a marked rise in the respiration rate, which continued to a striking degree as the spots spread. The generally accepted view of this is that the formation of carbon dioxide is due mainly to the active metabolism of the fungi which have become established, but in the papaw the destruction of the epidermal areas by the anthracnose fungus afforded a passage for increased leakage of the gas. Thus the increase in respiration rate coincident with the onset of wastage is chiefly referable to leakage through the partly destroyed epidermis under conditions of high internal carbon dioxide concentrations.

MEHRLICH (F. P.). **Pathogenicity and variation in Phytophthora species causing heart rot of Pineapple plants.**—*Phytopathology*, xxvi, 1, pp. 23–43, 1 fig., 1936.

Heart rot of the pineapple, associated in Hawaii with *Phytophthora parasitica*, *P. cinnamomi*, and *P. palmivora* (the two last-named in Oaku only) [*R.A.M.*, xiv, p. 604], has also been reported from Costa Rica (*Rev. Agric. Puerto Rico*, xxvi, p. 4, 1931), Jamaica [*R.A.M.*, xiii, p. 79], Porto Rico (*Rep. Porto Rico Exp. Sta.*, p. 31, 1905), Cuba [*R.A.M.*, iii, p. 346], and Queensland [ibid., xiv, p. 458], and also by growers from Haiti and the Philippine Islands. The writer's data as regards the distribution of the species of *Phytophthora* concerned in the etiology of the disease in Hawaii do not accord with those of Sideris and Paxton [ibid., x, p. 325].

The taxonomy of the heart-rotting pathogens is discussed and comprehensive evidence presented for the identification of *Pseudopythium phytophthoron* Sideris as a strain of *Phytophthora cinnamomi* Rands.

The occurrence in cultures of *P. cinnamomi*, *P. palmivora*, and *P. parasitica* of variations comparable to those recognized in the rusts as physiologic forms tends to invalidate the classification of *P.* spp. on the basis of differential susceptibility in a particular host. In this connexion the writer questions whether the separation of *P. cinnamomi* from *P. cambivora* [ibid. x, p. 754] is justified on the grounds of the differential symptoms induced by the two pathogens on potato tubers [ibid., x, p. 755]. The morphology of these two fungi being essentially similar, their combination as a single species, *P. cambivora*, comprising distinct strains, is suggested. A number of isolations of *P. parasitica* from rotted pineapples in Hawaii failed to grow, like *P. palmivora*, on maize meal agar at 35° C., so that Tucker's criterion of response to temperature [loc. cit.] for the separation of these two species does not appear to be altogether convincing.

A rot of green pineapple fruits was produced by inoculation with *P. cinnamomi* and *P. parasitica*, both of which were also pathogenic to radicles of *Ricinus communis*, the latter also attacking unwounded *Crotalaria incana*, *Richardsonia scabra*, and tomato seedlings; five local isolations of *P. cinnamomi* submitted to R. P. White [in New Jersey] for comparison with his *Rhododendron* strains [ibid., xii, p. 696] all proved capable of infecting the last-named host.

SERRANO (F. B.). **Pineapple yellow-spot in the Philippines.**—*Philipp. J. Sci.*, lviii, 4, pp. 481–493, 4 pl., 1935.

Pineapple yellow spot [*R.A.M.*, x, p. 474; xii, p. 304], first observed

in the Philippines (where it was probably introduced on infected planting material from Hawaii) in 1928, and found so far only on the Smooth Cayenne variety, ranks in importance locally next to fruitlet black rot [*Bacterium ananas*: ibid., xiv, p. 776] and mealy-bug wilt [ibid., xiv, p. 457].

The first symptom is a yellow spot 2 to 15 mm. in diameter, usually about 8 cm. distant from the base of a young leaf, the initial infection probably being carried upward from the base by the continued growth of the leaf. As a rule, only one leaf shows this spot, below which a yellow streak develops after a few days and extends down the base in the form of a water-soaked spot; under favourable conditions decay quickly sets in. Within a short time all the central leaves are affected; they become stunted, chlorotic, brittle, and tend to tighten together, the lower leaves remaining apparently normal. Diseased plants, when cut lengthwise, show patches of brown tissue in the stem round the attachment of the leaf that showed the initial spot. At this point the plant ceases growth and bends downwards.

Infection may occur at any time during the life of the plant, though it usually attacks young plants, causing dwarfing and ultimately death. Late infections are generally confined to the fruits and crowns. Infection may start from a flower or young fruitlet, in the same manner as in a young leaf, or it may begin in the crown of a young fruit. This type of infection results in malformation, dwarfing, yellowing, and rotting of a few 'eyes' of one side of the fruit, while the opposite side develops normally, forcing the fruit to bend towards the focus of infection. In advanced infections the fruit may become hollow, resembling the Kauai disease of Hawaii. All kinds of planting material are susceptible, suckers being least and crowns most liable to be affected.

Attempts to transmit the disease by mechanical means gave negative results [ibid., xi, p. 191], but transmission was successfully effected by larvae of *Thrips tabaci* [ibid., xi, p. 586] allowed to feed for over ten days on diseased pineapple plants and *Emilia javanica* and *E. sonchifolia* plants showing symptoms resembling yellow spot. The incubation period in the pineapple ranged from seven to twenty-five days. The disease was also transferred from the pineapple to healthy *Emilia* plants.

For purposes of control, clean cultural methods are indicated, while it is thought that insecticidal applications against the insect vector may also prove beneficial.

TAYLOR (G. G.). **Application of orchard-sprays. I. The stationary system.**—*N.Z. J. Agric.*, li, 6, pp. 321–329, 1935; lii, 1, pp. 34–38, 11 figs., 1936.

In this paper the author gives a general account of the stationary system of spraying orchards which was first introduced into New Zealand in 1925 and is now widely used throughout the Dominion [*R.A.M.*, xiii, p. 529]. The following points may be mentioned. The circulating system of piping has been abandoned in New Zealand in favour of the dead-end systems as the former requires more pipe and causes greater pressure loss. The underground position for the pipes has been found more advantageous than the overhead [ibid., xv, p. 28], or the laying of temporary mains on the soil surface [ibid., viii, p. 587].

Many of the systems in New Zealand have been installed with pipes too small in diameter; under average conditions the pressure loss in these systems may exceed 200 lb., or even 300 lb. in parts most distant from the pump. With larger pipes (1 or $1\frac{1}{4}$ in. diameter) the maximum pressure loss can be reduced to under 150 lb. without the cost of the pipes being excessive or the velocity of the spray being so reduced as to cause sedimentation. The maximum convenient length of hose is 120 ft. and the diameter (internal) $\frac{1}{2}$ or $\frac{3}{8}$ in.

To obtain relatively constant pressures at the nozzles the working pressure at the pump must be adjusted according to the parts of the orchard being sprayed, the amount of adjustment required being ascertained by means of a pressure gauge inserted between the hose and nozzle. To avoid accretion of spray materials in the pipes, the latter should be washed with water after each day's spraying.

The second part of the paper deals with the pumping station and discusses pump capacity, pressure and its adjustment, mixing tanks, agitators, engines, motors, reservoirs, and holding tanks.

TURNBULL (J.). **Spraying.**—*J. Minist. Agric.*, xlii, 9, pp. 865–870, 1935.

In this article the author discusses some recent developments in spraying technique in England. The employment of higher pressures has permitted the use of shorter and more convenient lances, and in order to reach the tops of the higher trees a fixed double nozzle [*R.A.M.*, xiv, p. 114] has been placed on the market. The new equipment enables spraying operations to be carried through much more rapidly than formerly, but requires pressures of not less than 250 lb. per sq. in., while 400 lb. can be employed, especially for larger trees. The selection of the right type of pump is of fundamental importance, whether portable or stationary systems are used; the correct size may be calculated from the quantity of spray required to complete one spraying and the rate of working per hour necessary to effect this within the time allowed, provision being made for losses of pressure and of working time, amounting to the equivalent of one half of the rated capacity of the pump, as well as for the fact that 5 or 6 hours' actual spraying is the maximum that can be attained in a $9\frac{1}{2}$ hours' working day. With the new equipment it is estimated a man can apply up to 2 or 3 galls. of spray per minute, and he can therefore spray two or three times as many trees a day while the effort required is less.

SCHMIDT. **Versuche zur Spritzung schwer benetzbarer Blätter mit Kupfermitteln.** [Experiments on the spraying of leaves difficult to moisten with copper preparations.]—*Blumen u. PflBau ver. Gartenwelt*, xl, 2, p. 20, 1 fig., 1936.

Neither home-made Bordeaux mixture nor the various commercial substitutes tested showed satisfactory adhesive properties when applied to the smooth, waxy leaves of cabbage and carnations, but very good results were obtained by the addition to the fungicide of 'tezet 10 S' which causes the formation of an almost continuous copper deposit over the sprayed surface.

CUNNINGHAM (G. H.). **Plant protection by the aid of therapeutants.**—xxvi+243 pp., 4 pl., 2 figs., 19 diags., 2 graphs, Dunedin, New Zealand, J. McIndoe, 1935.

In his preface the writer states that the present work aims at supplying, in encyclopaedic form, the latest available information (up to 1935) on the use of therapeutics in the control of bacteria, fungi, and insects attacking plants and the products thereof. The book is divided into six sections, viz., (I) sprays and spraying; (II) dusts and dusting; (III) fumigants and fumigation; (IV) disinfection of seeds, tubers, bulbs, and corms; (V) soil disinfection; and (VI) miscellaneous, each of which is subdivided into chapters as the treatment of the subject requires. Incorporated in the work is the information published by the writer from time to time in the *New Zealand Journal of Agriculture*, while assistance in various sections is acknowledged from E. E. Chamberlain, W. Cottier, J. G. Gibbs, J. C. Neill, G. G. Taylor, and others. The treatise forms a most compact and comprehensive account of modern plant protectives and makes an effective contribution to the literature of the subject which will no doubt be welcomed by phytopathologists, fruit-growers, and farmers alike. Interesting features of the work are a glossary of the scientific terms used in the various sections and a 26-page bibliography.

Le cinquantenaire de la bouillie bordelaise. [Fiftieth anniversary of Bordeaux mixture]—Supp. to *Rev. Path. vég.*, xxii, pp. 1–72, 3 figs., 1935.

In this supplement, commemorating the work of Millardet, the discoverer of Bordeaux mixture, a series of papers on the fungicide is communicated by various authors. Prof. P. Dangeard (pp. 10–16) deals with the scientific work of Millardet. J. Dubaquié (pp. 17–32) gives a historical outline of the events which led Millardet, in association with Gayon, to advocate the use of copper against vine mildew (*Plasmopara viticola*). L. Ravaz (pp. 33–40) describes the chief modifications that have been made in the formula of the mixture from time to time and refers to the extended use of the fungicide. J. Capus (pp. 41–8) discusses the influence of weather conditions on outbreaks of vine mildew and black rot (*Guignardia bidwellii*) [*R.A.M.*, xiv, p. 557] and emphasizes the importance of studying local climatic factors in relation to the moment of infection rather than in relation to the date of the appearance of the symptoms. E. Foëx (pp. 49–55) deals with the use of Bordeaux mixture against potato blight (*Phytophthora infestans*). M. Raucourt and J. Barthelet (pp. 56–60) summarize our present knowledge on the chemistry of the fungicide. MM. Trouvelot and Dixmeras discuss combined treatment of potatoes against Colorado beetle [*Leptinotarsa decemlineata*] and blight. The last-named authors suggest that when the insect attack occurs early in the season the first treatment should be purely insecticidal, but if late, a mixed treatment should be given. Applications made during the summer (at periods when either blight or the beetle threaten to develop) and late summer (if required) should also be mixed. Good results were obtained with a dust containing 11·5 per cent. arsenic (as calcium arsenate) and 8 per cent. copper.

Evans (A. C.) & Martin (H.). **The incorporation of direct with protective insecticides and fungicides. I. The laboratory evaluation of water-soluble wetting agents as constituents of combined washes.**—*J. Pomol.*, xiii, 4, pp. 261–292, 2 pl., 1 diag., 3 graphs, 1935.

This is a tabulated account of the results obtained in a preliminary investigation of the possibility of using laboratory methods for testing the efficacy, as wetting agents for insecticidal and fungicidal sprays, of the numerous chemical compounds that have recently been suggested for this purpose. The substances tested, namely, sodium oleate, igepon T (powder), sulphonated lorol, C 72, agral 2, C 75, agral N, crude calcium gamma-sulphonates, sodium resinate, saponin, gelatine, and sulphite lye were used as aqueous solutions in a simple small-scale apparatus consisting essentially of an atomizer, a pressure regulator, and a device for regulating the volume of spray applied; this device consisted of a large screen with a rectangular aperture in it, attached to a pendulum swinging between the atomizer and the surface sprayed, the volume of spray applied being regulated by the number of times the aperture in the screen swung directly across the centre of the spray cone. The spraying was done on standardized artificial surfaces, either simple cellulose lacquers to simulate the leaf surfaces, or shellac to represent easily wetted insect surfaces; glass plates and strips were dipped in these preparations, after which they were allowed to drain and dry for 18 hours before use. The amount of spray retained by the sprayed surfaces was determined either by direct weighing of the plates and slides before and after treatment, or by estimating, in the case of cupric sprays, the amount of copper retained. For the determination of the area of spread, drops of known volume (0·06 ml.) of the solutions were delivered from a small capillary tube on to thin glass plates coated with films of cellulose nitrate or acetate, or shellac. The contact angles were measured by the plate method suggested by Adam and Jessop, and surface tensions by the drop volume method.

The results of the work indicated that all the substances investigated may be arranged in the same rough general order of activity as wetting agents by their various physical properties examined, namely, spray retention, area of spread, contact angles, and surface tension. A high correlation was shown to exist between the wetting property (i.e., the ability of a liquid to form a persistent liquid-solid interface when excess of liquid is drained from the surface) and the receding contact angle of the spray, perfect wetting resulting when this angle is zero. Spreading properties may be assessed by the estimation of the area of spread which is determined by the advancing contact angle, but which, in solutions of similar advancing contact angle that were tested, was found to be greater with spreaders of long-chain structure. The maximum amount of spray initially retained upon the standard surface held at right angles was determined by the wetting and spreading properties, and decreased with increased wetting and spreading ability. The receding and advancing contact angles of the solutions exhibited a high correlation, with the exception of saponin solutions. It was further found that, except for these correlations, the determination of any one characteristic is insufficient to give a general assessment of the wetting

and spreading properties. There was, however, an indication that with materials of similar molecular structure it may be possible to deduce generalizations on the behaviour as a spray spreader and wetter from a limited number of characteristics which can be determined in the laboratory.

FREEMAN (E. M.). **Phytopathology—and its future.**—*Phytopathology*, xxvi, 1, pp. 76–82, 1936.

After briefly touching on the history of phytopathology and defining its scope, the writer attempts a forecast of its future, which is discussed with special reference to the increasing complexity of the problems involved, the need for specialization and at the same time for co-ordination with allied branches of science, the practical side of plant disease control, the mutual obligations of Federal and State departments and phytopathologists, and the inclusion within an autonomous professional guild of representatives of the scientific, teaching, technical, and practical aspects of plant pathology.

FOISTER (C. E.). **The relation of weather to fungous and bacterial diseases.**—*Bot. Rev.*, i, pp. 497–516, 1935.

The writer has extended and amplified his previous survey (1929) of the outstanding literature on the correlation between weather and plant diseases [*R.A.M.*, ix, p. 259], the bibliography here appended on which comprises 129 titles. The subject, introduced by a brief general statement, is discussed under the headings of epidemiology, antecedent factors, disease initiation and epidemics, physiological specialization, and fundamental research, and illustrated by appropriate examples of problems engaging the attention of phytopathologists in different parts of the world.

SĂVULESCU (T.). **Protecția plantelor și organizația fitopatologică in România.** [Plant protection and phytopathological organization in Rumania.]—*Publ. Inst. Cerc. agron. României* 19, 64 pp., 9 figs., 1 graph, 1935.

This is a Rumanian version of the author's German account of the organization and functioning of the plant protection service in Rumania published in 1934 [*R.A.M.*, xiv, p. 49]. Details are given of new orders that have appeared since the publication of the earlier version, including one, dated 4th Oct. 1934, regulating the production, movement, and sale of seeds and nursery stock within the country.

STEPANOFF (K. M.). Распространение инфекционных болезней растений воздушными течениями. [Dissemination of infectious diseases of plants by air currents.]—*Bull. Pl. Prot., Leningr.* 8, 2nd Ser. (*Phytopathology*), 68 pp., 4 figs., 1 graph, 1935. [English summary.]

After a review of the literature dealing with the dissemination by the air of infectious plant diseases, the author gives a full account of laboratory experiments and field observations in Leningrad and its vicinity on the factors involved in the process. Tests with various fungi, including *Monilia sitophila* [*R.A.M.*, xiii, p. 7], *Botrytis cinerea*,

Helminthosporium sativum, *Cunninghamella* sp. [ibid., xiv, p. 655], *Fusarium moniliforme* [*Gibberella moniliformis*], *F. scirpi* var. *acuminatum* [ibid., xiv, p. 409], *F. culmorum*, *Colletotrichum lini* [see above, p. 369], *Ustilago tritici*, *Puccinia triticina*, *P. coronifera* [*P. lolii*], and *Phytophthora infestans*, showed that while the spores of one group (e.g., *U. tritici*, *M. sitophila*, *B. cinerea*, and others) are very easily detached from the sporophores and carried away by the lightest air currents, those of another group, such as the aecidiospores of rusts, and the conidia from the aerial mycelium of *Fusarium* spp., are separated and carried through air with difficulty, and those of the third group, including *C. lini* and the conidia from *Fusarium* pionnotes and sporodochia, are not disseminated at all in the air. The great majority of the pathogenic fungi belongs to the first two groups (collectively termed anemochores), and those of the much less numerous third group (which includes many members of the Sphaeropsidales) depend for their distribution on the agency of animals (zoochores), water (hydrochores), and other mechanical means. It was also found that the spores may be carried upwards and distributed to short distances by slight convection air currents.

The rate of dropping of the spores was tested in Ukkelberg's apparatus [*R.A.M.*, xii, p. 498] and the rate of soaring in a special apparatus, termed the sporostat, in which spores were allowed to fall upon an upward current of air and observed through a beam of light. The results showed that in still air the spores dropped at very variable rates, depending on the size and on the individual differences of the spores.

In special open-air tests, in which spore masses of *Tilletia tritici* [*T. caries*] either alone or in mixture with *Bovista plumbea* spores were artificially disseminated and caught on glass slides at various places, it was shown that the settling down of the spores at different points from the centre of dissemination is governed by a law which may be expressed by the equation $y = c + \frac{a}{sx}$, where y is the distance between the source of spore distribution and the point of the settling down of the spores, x is the number of spores that have alighted per unit of area and per unit of time, s is the area of spore settlement investigated, and a and c are constants dependent on the special conditions of the test. By means of this equation it is possible to construct 'isospores', i.e., lines connecting the points where equal numbers of spores settle down around the focus of distribution.

In evaluating the danger presented by a given source of infection to crops and plants more or less distant from it, consideration should be given to the following factors: the ease of detachment of the inoculum from its substratum; the viability of the inoculum; the intensity of its dissemination through space; the abundance of the inoculum at its source; obstacles (mountains, hills, forests, and the like) to dissemination; size of the plant surfaces liable to infection (acreage and density of susceptible plant stands); 'limit norms' of air contamination with the spores (i.e., the maximum number of spores that alight per time unit and surface unit, unable to induce an economically important outbreak of the disease under the local ecological conditions); and the

environmental conditions (temperature, humidity, wind velocity, and so forth) at the infection focus and at the place of possible infection. By combining the data thus obtained, it will be possible to delimit zones outside which the given infection focus becomes inoperative in causing economically important disease outbreaks.

Ho (W. T. H.) & Li (L. Y.). **Preliminary notes on the virus diseases of some economic plants in Kwangtung Province.**—*Lingnan Sci. J.*, xv, 1, pp. 67–78, 11 figs., 1936. [Chinese summary.]

Investigations on the following virus diseases of plants occurring in Kwangtung Province, China, are described in this paper.

Infected peppers (*Capsicum* spp.) show a faint mottling of the leaves [*R.A.M.*, xiii, p. 219; xiv, p. 215], accompanied as a rule by general stunting of the plants. In extreme cases the leaves assume a filiform shape and papery texture. The disease was transmitted from infected to healthy pepper plants by means of sap, and mosaic symptoms were further produced on two *Capsicum* plants by inoculation with tomato mosaic virus.

Papaw mosaic [ibid., xi, pp. 26, 625] involves a puckering, upward curling, stunting, and yellow interveinal discoloration of the foliage, followed by desiccation and shedding. Badly diseased leaf blades are abnormally small with much shortened petioles and the size of the fruit is also greatly reduced.

A relatively mild virus disease of *Crotalaria saltiana*, extensively cultivated locally as a green manure, is characterized by foliar discoloration and poor seed.

Cucumbers in the Canton district display the typical foliar symptoms of Johnson's cucumber mosaic virus 3 [ibid., xiv, p. 811], with the addition of local or general chlorosis of the fruits.

Figs (*Ficus carica*) are liable to a form of mosaic [ibid., xv, p. 305] manifested by a pale yellow, generally somewhat indefinite mottling of the leaves, sometimes accompanied by necrosis and malformation.

Tomato mosaic is prevalent in Canton, causing up to 90 per cent. infection in the field and involving the local growers in immense losses in 1934, and has also been observed in Fukien Province, Shanghai, Nanking, Hangchow, and Peiping [Pekin]. Cross-inoculation experiments with the virus on tobacco, pepper, potato, and cucumber resulted in 0, 60, 100, and 100 per cent. infection, respectively, indicating a relationship with the cucumber virus rather than with that of tobacco, though unlike the former it was not inactivated by ten minutes' heating at 80° C. or by two month's ageing. Inoculations were successful both by means of needle pricks and aphid feeding, young plants infected during December and January generally responding by more pronounced filiform or 'fern-leaf' symptoms [ibid., xv, p. 181] than those inoculated in March or April. Other symptoms include foliar bunching, mottling, crinkling, and marginal dentation, and the development on the fruits of characteristic yellow and deep green patterns. Pruning with a contaminated knife was found to disseminate infection. Suspected insect vectors of the disease are the cucumber beetle (*Ceratia orientalis Hornst.*) and *Epilachna 28-punctata* Fabr. Varietal reaction tests indicated that Peachblow, Burpee, and Sutton's Best of All are

immune from mosaic, while Sutton's Prince of Wales and Money Maker may show up to 100 per cent. infection; a fair degree of resistance (10 per cent.) was manifested by Sutton's Perfection, Kondine Red, Ponderosa, Super Standard Bonny Best, two types of Earliana, and Walker's Recruit.

Typical features of mulberry mosaic [ibid., xiii, p. 219] are chlorosis, puckering, a papery consistency, malformation, and torsion of the leaves. Local methods of cultivation afford excellent opportunities for the natural transmission of the disease, which was also experimentally effected by grafting. The related paper mulberry (*Broussonetia papyrifera*) has been found to suffer from a similar disturbance.

Tobacco mosaic appeared in a characteristic form in a nursery plot at the Kwangtung Provincial Bureau of Agriculture and Forestry. The disease has further been observed in Hopeh Province and is believed to be co-extensive with tobacco cultivation in China.

Bean (*Phaseolus vulgaris*) mosaic [see above, p. 341] has been found to attack eleven local varieties. Four out of ten seedlings raised from the seed of a diseased plant gave indications of mosaic. The virus infecting Lima beans (*P. lunatus* var. *macrocarpus*) induces a much more diffuse mottling than that on *P. vulgaris*.

Florida High Bush eggplants are liable to severe infection by a typical mosaic causing stunting, discoloration, and distortion of the foliage and reduction in size of the fruits [ibid., xv, p. 202]. The indigenous Pak and Hung varieties appear to be resistant.

Potato mosaic symptoms are more conspicuous under Kwangtung conditions during the winter. The virus is transmissible to tomatoes.

Sugar-cane mosaic [see below, p. 398] and mosaic of maize were also observed [ibid., ix, pp. 300, 724, and above, p. 346].

RYJKOFF (V. L.). Вирусные болезни растений. Общая и частная вирология. [Virus diseases of plants. General and specific virology.]—247 pp., 62 figs., 3 graphs. Госуд. Издат. колх.-совх. Литер. "Сельхозгиз" [State Publ. Off. Lit. collect. co-op. Farming 'Selkhozgiz'], Leningrad, 1935.

In the first part of this monograph the author [who transliterates his surname RISCHKOW] gives a concise survey of the progress attained in recent years in the study of filterable viruses causing disease in plants (with incidental reference to those of man and animals), mostly compiled from the results obtained by workers in other countries. After discussing the theories already advanced regarding the nature of viruses, he suggests that these agencies may be a chemical substance (or substances) of the nature of an enzyme which, when introduced into an host cell, induces the latter to elaborate ever accumulating amounts of the same substance, this explaining the apparent multiplication of the virus in living host tissues. The different chapters of this general section deal with the morphological, anatomical, and cytological changes produced by the viruses in the host plants; the physiology of the virus diseases, including the effect of environmental conditions on their development and external expression; methods of transmission; movement of the virus in host tissues; susceptibility and immunity of the plants; geographical distribution of the diseases; control measures;

classification of the viruses; and methods generally used for the description of the diseases.

The second part consists of a more or less detailed account from literature of all the virus diseases so far known of useful and ornamental crops, arranged by the hosts, the greatest space being given to the diseases of the potato, tomato, and tobacco. The bibliography at the end of the volume covers 20 pages.

MANIL (P.). **L'étude sérologique des maladies à virus des végétaux.** [The serological study of plant virus diseases.]—*C.R. deuxième Congr. Sci., Bruxelles*, pp. 998–1004, 1935.

In this address, delivered at Brussels in June, 1935, the author succinctly reviews and discusses the most recent advances in the serological study of filterable plant viruses. Practically all the work referred to has already been noticed in this *Review*.

BOTJES (J. G. O.). **De stand van het immuniteitsvraagstuk bij virusziekten van de planten.** [The status of the immunity problem in virus diseases of plants.]—*Tijdschr. PlZiekt.*, xlii, 1, pp. 1–9, 1936.

The present position of the problem of immunity in relation to virus diseases of plants is discussed, with reference to current studies on the subject in Europe and the United States, under the following headings: selection of attenuated virus strains [*R.A.M.*, xiii, p. 179]; whether such strains arise spontaneously under given environmental conditions or by selection from already existing strains [ibid., xiii, p. 330]; acquired immunity [ibid., xiv, p. 812]; the range of immunity from specific virus diseases [ibid., xi, p. 750; xii, p. 581]; and observations in connexion with the question of immunity from virus diseases in potatoes in Holland.

VANDERWALLE (R.). **Quelques caractères physiologiques de différentes souches de Verticillium du groupe dahliae.** [Some physiological characters of different strains of *Verticillium* of the *dahliae* group.]—*Bull. Inst. agron. Gembloux*, iv, 4, pp. 378–398, 1 fig., 1935. [Flemish, German, and English summaries.]

After describing the cultural behaviour of six strains of *Verticillium dahliae* [see above, p. 370] from potato, rose, orchid, tomato, aster [*Callistephus chinensis*], and chicory [*Cichorium intybus*] on Raulin's agar at P_H 6·8, the author records the growth characters of the three latter strains on Raulin's liquid medium adjusted to different P_H values and also on the agar by using a method similar to that devised by Labrousse and Sarejanni [*R.A.M.*, ix, p. 549]. The results indicated the presence of physiological differences which cross inoculations showed did not amount to definite specialization. When each of five of the strains (the orchid strain being omitted) was inoculated in turn into all the hosts, yellowing and slight wilting was produced, the organism being reisolated in every case.

On Raulin's medium the tomato, chicory, and aster strains rapidly acidified the medium, which reached a maximum of P_H 3·7 to 4 whatever the initial value. The tomato strain produced rapid acidification followed by an equally rapid return to alkalinity and reaching P_H 8 to

8·4 after 28 days. The chicory strain produced slow, very slight acidification and a correspondingly slow decline in acidity which did not fall below P_H 5·4. The aster strain caused rapid but slight acidification, the medium quickly returning to its initial P_H value. In tests of the effect of these strains on the oxy-reduction potential no change was apparent.

Experiments with the tomato and rose strains on Richards's medium with different nitrogen constituents showed that with nitrogen as potassium nitrate acidification in general increased slightly but fell back rapidly, whilst with ammonium chloride the P_H fell rapidly to 3·1 without return towards alkalinity, and with ammonium the P_H was hardly altered.

ELPIDINA (Mme O. K.). **On toxins of wilting.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., iii, 8, pp. 360–364, 1935.

In the experiments outlined in this paper the author tested the wilting effect on cut clover and potato leaves, and sweet clover and tomato seedlings of the toxins extracted by two different methods, the first based on Richter's method (*Жур. оп. Агр. Ю.-В.* [*J. exp. Agric. S.E.*], 1929) and the second that used by Schaffnit and Lüdtke [*R.A.M.*, xii, p. 314], from the solid and liquid substrata of pure cultures of a species of *Fusarium* which causes a potato wilt in Russian Central Asia. The results [which are tabulated] showed that while the four hosts tried differed from one another in their reaction to the different toxin preparations, the greatest wilting effect on all of them was exerted by those solutions that contained the largest amount of ammonia. The same toxin solutions were unable to cause any wilting of the plants tested after the ammonia had been removed from them. These findings indicate that the toxic principle of the toxin solutions is ammonia, and the conclusions of the German authors are considered to be vitiated by the fact that methyl alcohol, used by them for extraction, is a good solvent for a number of ammonium salts, this warranting the belief that their toxin preparations were fairly highly concentrated solutions of ammonium salts.

SALGUES (R.). **Les modifications biochimiques en phytopathologie. Sur les substances hydrocarbonées de la feuille d'Ampelopsis veitchii hort.** [Biochemical modifications in phytopathology. On the carbohydrate content of the leaf of *Ampelopsis veitchii* hort.]—*C.R. Soc. Biol., Paris*, cxx, 40, pp. 1212–1214, 1935.

Both in healthy foliage of *Ampelopsis veitchii* [*Parthenocissus tricuspidata*] and in that displaying the dingy brown, circular lesions of *Phyllosticta allescheri* in the Midi (south of France), soluble polysaccharides were observed to increase steadily from 10th August to 15th October, while the insoluble polysaccharides declined during the same period; from 15th to 30th October there was a rapid diminution of soluble sugars and a slight decrease of insoluble carbohydrates in both healthy and diseased leaves. There is thus no essential difference in the chemical processes undergone by the two series of experimental material, the sole distinction lying in the much slower rate at which they were accomplished in the infected foliage. The latter retained its green

colour and remained attached to the branches after the healthy leaves had fallen. These data are considered to bear out the results of previous studies on the same lines indicating the existence of a parallel between juvenility and a pathological state of the tissues [*R.A.M.*, xv, p. 116].

BALDACCI (E.). **Ricerche intorno alla cosidetta vaccinazione nelle piante.** [Researches on the so-called vaccination of plants.]—Reprinted from *Atti Ist. bot. Univ. Pavia*, Ser. IV, vii, 58 pp., 1 fig., 1935. [Latin and English summaries.]

After reviewing the literature on acquired immunity [*R.A.M.*, xiv, pp. 713, 783] the author describes in detail a number of inoculation experiments [the results of which are fully tabulated] on rice seedlings vaccinated by growing them in culture filtrates or mycelial extract of *Sclerotium* (*Corticium*) *rolfsii*, *S.* (*C.*) *centrifugum*, and *S. oryzae* Curzi's strain, strain II, and strain I.M.I. (= *Leptosphaeria salvinii*), [ibid., xv, p. 313], the filtrates being diluted to 1 in 10, 1 in 50, and 1 in 100 and the mycelial extract to 1 in 100.

In the first experiment, seedlings grown in culture filtrates and inoculated with *S. rolfsii*, *S. centrifugum*, and *S. oryzae* strain II showed, respectively, 50, 60, and 7·6 per cent. mortality, as against 90, 100, and 25 per cent. in the corresponding controls, but after 20 days only the plants grown in the filtrate of *S. centrifugum* showed a lower mortality than the controls. This result might be taken to indicate that the vaccinations had exerted a temporary immunizing effect, but if the figures relating to the other two strains of *S. oryzae* are included and the data arranged according to the dilution of the extract it is found that 63, 40, and 33·3 per cent. of all the plants grown in culture solutions diluted 1 in 10, 1 in 50, and 1 in 100, respectively, and inoculated with the respective fungi, were killed within ten days, as compared with 43·7 per cent. in the controls; of the plants treated with the mycelial extract only 3·2 per cent. were then dead. By the 20th day all the effects of the vaccinations had disappeared, there being 93·3, 80, 84·8, and 77·4 per cent. dead plants for the three dilutions and the mycelial extract, respectively, as against 68·7 per cent. in the controls.

In a second series of experiments, seedlings inoculated with *C. rolfsii* and *S. oryzae* strain Curzi and strain II and grown in their respective culture filtrates died before the controls, while with *S. oryzae* strain I.M.I. the vaccinated plants and the controls died on the same day; with *C. centrifugum* the plants vaccinated at a dilution of 1 in 100 showed more resistance to infection than the controls.

When the plants were left exposed to the vaccines for an indefinite period (without inoculation) after 30 days, 41, 41·6, 53·8, 53·8, and 61 per cent. of those vaccinated with *C. rolfsii*, *S. oryzae* strain II, *C. centrifugum*, *S. oryzae* strain I.M.I., and *S. oryzae*, Curzi's strain, respectively, were dead, or arranging the data according to the dilution of the vaccine, 71, 40, and 13·3 per cent. were killed at dilutions of 1 in 10, 1 in 50, and 1 in 100, respectively. The mycelial extract was responsible for 68 per cent. mortality in the same period.

These results show that the vaccines produced a toxic effect after the plants had been exposed to them for an appreciable period, and that the mycelial extract is more toxic than the culture filtrate. The difficulties

of interpreting the results of experiments on plant vaccination are discussed and many errors are pointed out. The author concludes from the results of his studies and those of earlier investigators that plant vaccination has not yet been definitely established.

Bawden (F. C.) & Pirie (N. W.). **Experiments on the chemical behaviour of Potato virus 'X'.**—*Brit. J. exp. Path.*, xvii, pp. 64–74, 1936.

A tabulated account is given of a series of experiments [the technique of which is described] to determine the effects of certain enzymes on purified suspensions of the S strain of potato virus X, which produces local necrotic lesions and systemic symptoms in the shape of necrotic spots and rings in infected White Burley tobacco plants [*R.A.M.*, xv, p. 172]. The virus was inactivated by eight hours' contact at P_H 7 and 38° C. with a 0·15 per cent. solution of Merck's pancreatin, containing about 90 per cent. lactose, the inactivating factor being soluble in petrol ether. The addition to the suspensions of trypsin immediately reduced the infectivity of the virus without affecting the flocculating property with antiserum, whereas crystalline trypsin at 0·05 per cent. destroyed both these properties after three hours' incubation at P_H 7. Neither papain nor cyanide alone exerted any effect on the virus, which was inactivated, however, by a combination of the two (0·17 per cent. of each) at P_H 4 after an incubation period of 5 hours 10 minutes. Used at a strength of 1·1 per cent., nitrous acid completely destroyed the infectivity of the virus in one hour at hydrogen-ion concentrations above P_H 4·8 without impairing its capacity for flocculation with antiserum.

The fact that virus X, unlike tobacco mosaic and certain animal viruses, is rapidly inactivated in the presence of certain proteolytic enzymes cannot be regarded as conclusive proof that this infective principle contains protein [ibid., xiv, p. 721], for even the crystalline preparations of enzymes may contain substances besides trypsin or pepsin, but taken in conjunction with other features of the virus the data here presented are regarded as highly suggestive. Possibly the strongest evidence for the presence of protein in virus X is that afforded by the experiments with papain, which remained inactive towards the virus until contact with cyanide provided the necessary stimulus.

Köhler (E.). **Über die Variabilität des Ringmosaikvirus (X-Virus) der Kartoffel.** [On the variability of the ring mosaic virus (X virus) of the Potato.]—*Naturwissenschaften*, xxiii, 49, pp. 828–830, 1935.

The writer's observations at Berlin-Dahlem are stated to have confirmed those of J. Johnson and Koch in respect of the divisibility of potato ring mosaic [*R.A.M.*, xv, p. 247] into two types, namely, potato ring spot and mottle virus [ibid., xiv, p. 523], of which the latter is characterized by a superior degree of thermostability. Each type comprises strains of varying virulence. To the ring spot virus belong, for instance, the following strains previously isolated by the writer: Mb 12 from Magnum Bonum, E 1 from Erdgold, and H 19 and M 23 from Kl. Sp. Wohltmann [ibid., xiv, p. 388], of which Mb 12 is the least pathogenic (virtually latent) and M 23 the most. The mottle virus was detected

principally in the Erstling (Duke of York) variety and was found to fall into three strains, Erstl. 34, 25, and Mix, of which the first is semi-latent and the third the most virulent. All three have shown a fair degree of constancy. Further evidence was obtained of the protective action of one virus against another [loc. cit.]. E 1 exerted an immunizing action against M 23 but not Erstl. 25, and Erstl. 34 against Erstl. 25 but not against Mb 12 or H 19.

Of the two types under discussion, the ring spot (as already shown by Böhme) [ibid., xiii, p. 319] is much the more virulent, being successfully inoculated by rubbing into the Erdgold, Parnassia, and Paul Krüger [President] varieties, but not into Ackersegen, while none reacted positively to the mottle virus. Another important difference between the ring spot and mottle viruses lies in the presence in the former of a number of subtypes which are conspicuously absent from the latter, or rather are represented only by quantitative variations in virulence. Thus, Duke of York plants yielded a strain, Cs, which produces on inoculation into tobacco a well-defined tortoise-shell pattern. In conclusion attention is drawn to the frequent occurrence in tobacco, and probably also in potato, of mixtures of virus types and subtypes in which one partner ultimately gains the upper hand and so creates a false impression of spontaneous changes in the virulence or nature of the type. In Duke of York, for example, the tortoise-shell virus, with its powerful penetrative capacity, may in certain strains usurp the place of the original mottling principle.

Köhler (E.). **Fortgeführte Untersuchungen über den Kartoffelabbau.** [Continued investigations on Potato degeneration.]—*Landw. Jb.*, lxxx, 3, pp. 379–408, 1936.

Continuing his studies on the etiology of potato degeneration in Germany, the writer gives a comprehensive, tabulated account of the results of an examination of Silesian consignments of the Erdgold and Stärkereiche [Starchy] varieties, among which the following viruses were observed: leaf roll, streak or Y mosaic, different varieties of the X virus [see preceding abstract], a relatively thermolabile virus, provisionally termed 'P', readily transmissible to tobacco by means of the juice and presumably belonging to the Y category, and slight mosaic infections of an indeterminate character, mostly non-transmissible to tobacco. The P virus causes on tobacco seedlings a slight mosaic which later disappears, while on plants in the field no mosaic symptoms are produced but the leaves show a tendency to roll upwards; these symptoms are not specific, but the virus can be recognized by the characteristic indefinite yellow discoloration along the veins resulting from mixed infection with the X virus.

An analysis of the yield data in greenhouse and field tests indicated that leaf roll and streak are virulently infectious to Erdgold, the Starchy variety also suffering severely from the first-named, while even the comparatively mild forms of mosaic exerted a detrimental effect on tuber production in greenhouse trials with Erdgold cuttings.

Wartenberg's and Hey's electrometric method of determining the value of tubers for seed [*R.A.M.*, xv, p. 171] proved to be applicable only to early maturing varieties such as Erstling [Duke of York], the tuber

potential in the case of the later sorts (Erdgold and Starchy) remaining virtually uninfluenced by the virus infections.

BLATTNÝ (C.). **Ozdravovací pokus se sortou Bramborů 'Pražské rohlíky'.** [An attempt to restore the health of the Potato variety 'Pražské Rohlíky'.]—*Rec. Inst. Rech. agron. Rép. tchécosl. 1935*, 137, pp. 33–38, 1935. [German summary.]

The author states that by strict selection of potato seed-tubers from apparently healthy plants, and by roguing out of all virus-diseased plants from the fields at the first appearance of symptoms, he succeeded, after eight years' work, in reducing infection in the variety 'Pražské Rohlíky' (which is highly esteemed locally) from 90 to 3 per cent. The work has now been abandoned, however, owing to the high susceptibility of this variety to infection with different viruses [see next abstracts] as well as to wart disease [*Synchytrium endobioticum*]. Comparable results were also obtained in similar work during seven years with the variety Blauäugige, closely related to the British Arran Victory, and it is being prosecuted further owing to the high wart resistance and excellent commercial qualities of this potato.

BLATTNÝ (C.). **Příspěvek k léčení virových chorob Bramborů.** [Contribution to the therapy of the virus diseases of the Potato.]—*Rec. Inst. Rech. agron. Rép. tchécosl. 1935*, 137, pp. 39–42, 1935. [German summary.]

The experiments briefly reported in this paper consisted in cutting tubers of the local Modraky potato variety, affected with various viruses, into two halves, one of which was injected with 1 c.c. of either insulin (50 units), albumin, asparagin, d-arginin carbonate, histidin (each 2 per cent.), or four other substances, and the other was planted untreated. During the first season a certain qualitative but not quantitative reduction was noticed in the virus diseases [see next abstract] (especially leaf roll) in the plants raised from the halves treated with some of the preparations, but these differences were for the most part only transient and were obliterated later in the season. No differences at all were observed in the next season in the progeny of the treated and of the untreated halves, indicating that the treatment had no lasting effect on the virus content of the tubers.

BLATTNÝ (C.). **Pokus o vlivu závlahy a vlivu doby sázeni na zdravotní stav Bramborů.** [Experiments on the influence of watering and of the date of sowing on the health of Potatoes.]—*Rec. Inst. Rech. agron. Rép. tchécosl. 1935*, 137, pp. 43–47, 1935. [German summary.]

Comparative experiments in 1933 and 1934, in which tubers of a virus-infected line of Erstling [Duke of York] potatoes were used, showed that virus diseases (leaf roll [see preceding abstract], crinkle, mosaic, and stipple-streak) were considerably masked, and the yield of the plants was increased by 15·2 per cent. in the plots which were watered from above at regular intervals. The spread of the diseases in these plots was also reduced by 13·6 per cent. of that of non-watered plots. These results are chiefly attributed to the reducing effect of

watering on the number of infective aphids, the averages being 322 aphids per stool in the non-watered and 258 in the watered plots. Experiments on the control of the aphids by applications to the growing plants of derris and pyrethrum powder gave promising results.

Collateral experiments in the same years showed that the spread of the virus diseases was further reduced by 24 per cent. by sowing the diseased tubers in summer time instead of in the spring, this being attributed to the same cause as that mentioned above, since the average population of aphids per stool was 289 in the spring and 56 in the summer of 1933.

Köck (G.) & Greisenegger (K.). **Tätigkeitsbericht des Kartoffel-Fachausschusses über das Jahr 1935.** [Report on the work of the Potato Expert Committee for the year 1935.]—*Neuheiten PflSch.*, xxviii, 6, pp. 164–167, 1935.

A summarized account is given of the activities of the Austrian Potato Expert Committee during 1935 [cf. *R.A.M.*, xiv, p. 464]. Attempts to combat wart disease [*Synchytrium endobioticum*] by means of soil treatments [ibid., xv, p. 112] with various types and amounts of sulphur were a complete failure in contrast to the promising results given by similar experiments in the previous year. It appears probable, however, that the disease will gradually decrease in intensity, and perhaps disappear altogether with the exclusion from the fields of susceptible varieties, and a tendency in this direction is in fact already manifest. Of 95 selected strains from various localities tested for their reaction to *S. endobioticum* in the laboratory, 59 proved to be susceptible.

Three applications of 1 per cent. Bordeaux mixture controlled *Phytophthora* [*infestans*] in the Alma and Hindenburg varieties, the increases of yield in the former amounting to 21, 34, and 18 per cent., respectively, in the plots sprayed at the rates of 20, 15, and 10 l. per sq. m. Out of 67 varieties tested for their behaviour in respect of late blight and tuber rot, 47 were affected by both manifestations of *P. infestans* and only one was resistant to both.

Blattný (C.). **Příspěvek k poznání hlenky Bramborové.** [Contribution to the knowledge of powdery scab of Potatoes.]—*Rec. Inst. Rech. agron. Rép. tchécosl. 1935*, 137, pp. 21–25, 5 figs. (at the end of the fascicle), 1935. [German summary.]

On the occasion of an exceptionally heavy outbreak of powdery scab (*Spongospora subterranea*) [*R.A.M.*, xiv, p. 525] of potatoes which occurred in 1934 in various regions of Czecho-Slovakia, especially on acid and waterlogged soils with relatively high rainfall, the author observed certain morphological, histological, and ecological differences between the form of the disease that developed abundantly on the root system and less frequently on the underground part of the [main] stems (very rarely on the stolons), and that on the tubers. On the former the swellings produced are numerous, small, and wart-like, the spore balls are formed in any of the tissue layers, are yellowish-brown in colour, and measured 26·4 to 62·05 μ (average 48·5 μ), while on the tubers the swellings are isolated, scab-like, and disintegrating, the spore balls

are chiefly subcuticular, greyish-brown in colour, and 26·4 to 77·5 μ (average 52·1 μ). The root form, however, did not apparently affect adversely the general health and yield of the plants, and in three out of 30 attempts it was induced to infect potato tubers, on which the usual form was reproduced. Whilst not specifically distinct, therefore, the two forms are separated by the author, the root form under the name *S. subterranea radicicola* and the tuber form as *S. subterranea tubericola.* It is further suggested that the root form may be rather a mycorrhizal than a parasitic fungus, the solution of this question being left for further investigation.

Rode (A.). **Zur Frage des Kartoffelschorfes.** [On the question of Potato scab.]—*Dtsch. landw. Pr.*, lxiii, 1, p. 4, 1936.

Pending the development of potato varieties combining immunity from scab [*Actinomyces scabies*] with other desirable qualities, the most practical method of combating the disease in the clay soils of North Hanover appears to lie in rational crop rotation [*R.A.M.*, xiii, p. 51], allowing a minimum of five, and preferably six, years to elapse between one potato crop and the next and interposing, for instance, fallow, oats, swedes, summer barley, and oats.

Miller (J. C.). **The developing and growing of certified seed Potatoes for subtropical and tropical countries.**—*Amer. Potato J.*, xiii, 1, pp. 9–10, 1936.

Louisiana potato-growers desirous of raising stock for certified seed for export to southern countries, such as Cuba, must first procure from a northern State certified seed, the foundation stock of which has already given satisfaction in Louisiana. Before planting, the potatoes must be treated for surface diseases, e.g., scab [*Actinomyces scabies*]. At four to six weeks old the crops are officially inspected for virus diseases [cf. *R.A.M.*, xv, p. 248], of which mild and rugose mosaics are the most prevalent under local conditions. On lifting, the potatoes are transported in 100 lb. sacks to cold storage at 38° to 40° F., where they remain until ready for shipment, prior to which they are again inspected and certified by a Federal official.

Braun (H.). **Alternaria solani als Parasit der Kartoffelknolle.** [*Alternaria solani* as a parasite of the Potato tuber.]—*NachrBl. dtsch. PflSchDienst*, xv, 12, pp. 10–111, 3 figs., 1935.

Alternaria solani, hitherto regarded in Germany exclusively as a potato leaf parasite [*R.A.M.*, x, p. 202; xv, p. 246], has recently been found to cause a typical dry rot of the tubers, a similar phenomenon having also been observed, according to a written communication from Dr. Roth of Crefeld, in Belgium [ibid., xiv, p. 679]. The fungus was isolated from infected Erstling [Duke of York] tubers and successfully inoculated into healthy ones of the same variety; in the case of Wohltmann the reaction was less intense. The fact that *A. solani* is included among the pathogens to be considered in relation to the certification of Dutch seed potatoes is a further indication of its growing importance as a tuber parasite.

Hino (I.). **Antagonistic action of soil microbes with special reference to plant hygiene.**—*Trans. third int. Congr. Soil Sci.*, i, pp. 173–174, 1935.

The author has shown that potatoes remain healthy in the presence of soil protozoa notwithstanding inoculation by *Bacillus aroideae* [see above, p. 346], while they wilted in a few days in the absence of protozoa. The latter were inactivated, however, by large amounts of inoculum and also by extremes of temperature. Other plant pathogens destroyed by protozoa were *Bacterium* [*Pseudomonas*] *hyacinthi* [*R.A.M.*, xv, p. 298], *Bact.* [*P.*] *citri* (82 and 72 per cent., respectively, in four days), *Fusarium* sp., and *Penicillium* sp. (12 and 18 per cent., respectively, in 24 hours). *B. aroideae* is further liable to attack by a number of soil bacteria, including *B. prodigiosus*, *B. proteus*, and *B. megaterium* [ibid., xv, p. 140]. Nakata found in Fukuoka, Japan, that *Bact. solanacearum*, the agent of tobacco wilt [ibid., xv, p. 180], is frequently killed by the admixture with the culture of *B. mycoides*, *B. fluorescens*, *B. cereus*, *B. proteus*, and *Azotobacter chroöcoccum*, while Endô's experiments in the writer's laboratory revealed the extreme antagonism of *B. prodigiosus* and other bacteria to *Hypochnus centrifugus* [*Corticium centrifugum*: ibid., xiv, p. 719]. The last-named, *H.* [*C.*] *sasakii* [ibid., xiv, p. 795], and *Sclerotium oryzae* [*Leptosphaeria salvinii*: see above, p. 389], incorporated in a loamy soil, were all destroyed in five days by *Bact. lactis*. A number of soil fungi (including actinomycetes) were also found by Nakata to prey upon *Bact. solanacearum* and by Endô to infest *C. centrifugum*, but in general the action of these organisms is less potent than that of the bacteria. *Trichoderma lignorum*, however, was ascertained by the writer to be highly destructive to *Sclerotinia libertiana* [*S. sclerotiorum*], *C. centrifugum*, and *C. sasakii* [cf. ibid., xiv, p. 739], and a pathogen of this type is more suitable for the control of harmful parasites than are protozoa, the abundant presence of which is liable to induce soil sickness.

Blattný (C.) & Vukolov (V.). **Nakažlivá neplodnost Chmele.** [Infectious sterility of the Hop.]—*Rec. Inst. Rech. agron. Rép. tchécosl. 1935*, 137, pp. 3–18, 17 figs., 1935. [German summary.]

An account is given of the authors' studies since 1924 of the 'hereditary' or infectious sterility of hops [*R.A.M.*, vi, p. 692; xi, p. 624] in Czecho-Slovakia. The macroscopic symptoms, to the untutored eye, are indistinguishable from those of temporary sterility which occasionally affects during one or two years some hop plants, while even those that are apparent to the expert, e.g., delayed development of seasonal growth, weaker reaction of the affected plants to manuring, mottled, darker green or chlorotic, and malformed foliage, shortened internodes, failure of the lower stem buds to develop, and profuse and irregular development of the apical shoots, the growing points of which are soon killed, and the like, are often deceptive, and are reminiscent of other diseases, chiefly of virus origin [a brief description of which is appended]. The only reliable external sign of the disease is the more or less complete sterility of the affected hop plants during three consecutive years, which explains why the diseased plants are practically never removed from

hop gardens before at least the fourth year. The disease is distributed over all the country, and the average incidence is estimated at about 0·3 per cent. of the plants.

Microscopically the disease is characterized by the extensive phloem necrosis of all the non-lignified organs, and especially of the growing points, where the necrosis is particularly deep-seated and appears before the differentiation of the tissues. The necrosis was also observed in the leaf petioles and the main veins of the leaves. It is typified by a swelling of the cell walls; phloem parenchyma in the neighbourhood of the vessels may also be affected, and the vessels, though not attacked themselves, may be filled with a granular substance. The roots and woody parts of affected plants do not show pathological changes, except that the phloem in the immediate vicinity of the undeveloped basal buds on the bines may also be necrotic.

The disease could not be transmitted experimentally by mechanical methods, through the soil, or by insects, but it was readily transmitted by grafting, both from diseased stock to the scion and vice versa; cuttings taken from affected plants were invariably diseased. All the characters described are considered to indicate that the disease is caused by a virus, the origin of which is not known; the possibility is suggested that it may result from the splitting up of some complex virus of the hop, certain evidence suggesting that it may have originated from the dissociation of the virus of the 'kadeřavost' disease [loc. cit.].

AZEVEDO (N.). **Nota sobre um lichen prejudicial ao Guaco (Mikania scandens L.).** [A note on a lichen harmful to Guaco (*Mikania scandens* L.).]—*Rodriguésia*, i, 3, pp. 33–34, 3 pl., 1935.

Mikania scandens, a medicinal plant growing in the Botanical Gardens, Rio de Janeiro, was observed to show a heavy leaf infection by the lichen *Strigula elegans* Fée & Müll. f. *hirtella* Müll. Arg., the upper leaf surfaces being almost completely covered with pustules 3 to 5 mm. in diameter. Infection on the lower surfaces was less intense.

To prevent infection it is recommended that the plants should be grown in places where they receive direct sunlight; affected plants should be sprayed with 2 per cent. Bordeaux mixture.

PAL (B. P.) & NATH (P.). **Phyllody: a possible virus disease of Sesamum.** —*Indian J. agric. Sci.*, v, 4, pp. 517–522, 4 pl., 1935.

Sesamum indicum [*S. orientale*] plants at Pusa are every year affected by a condition known as 'phyllody' and recorded elsewhere as 'green flowering' disease [*R.A.M.*, viii, p. 355; xii, p. 748]. Affected plants bear flowers in which all the floral members except the stamens are transformed into leaf-like organs or show a marked tendency to become leafy. The stamens seldom contain functional pollen and the plants may be completely sterile. The condition may begin with the first flower, all subsequent flowers then becoming affected, or it may occur later, in which case the flowers formed previously are normal, but the tips of the branches and main axis and the new growth from the base are phylloid. Shortening of the upper internodes always occurs, so that the abnormal flowers are crowded together; the foliage leaves are dwarfed, and in the floral region they may be pale. Phylloid flowers

are radially symmetrical. Glandular hairs are found in parts where they are normally absent, while varieties which normally develop only one flower in each leaf axil show three flowers per axil. The calyx is polysepalous, and the primary veins of the sepals are thick and prominent; the apices of the petals are rounded. A fifth (anterior) stamen is usually developed, while the ovary is enlarged, the style is reduced, and the carpellary wall transformed into two foliaceous structures.

Attempts to transmit the disease by sap inoculations gave negative results. But when four pairs of sesame plants (each consisting of one normal and one phylloid plant) were reciprocally grafted, three weeks later in one graft the originally normal scion showed signs of the condition, while in the other three all the new branches produced by the originally healthy stock bore phylloid flowers. This result suggests that the disease is systemic and may be due to a virus. Some evidence was obtained that early sowings develop a larger proportion of affected plants than late ones.

MATSUMOTO (T.) & YAMAMOTO (W.). **On the perfect and imperfect stages of the fungi causing Sugar-cane diseases.**—*J. Plant Prot.*, xxiii, pp. 9–14, 107–115, 7 figs., 1936. [Japanese.]

Leptosphaeria sacchari, the agent of ring spot of sugar-cane [*R.A.M.*, xiv, p. 397], was found to produce abundant pycnidia of a species of *Phyllosticta* besides the perithecia on certain culture media as well as on the natural lesions, thereby substantiating the genetic connexion between the perfect and imperfect stages observed by Bourne in Florida [ibid., xiv, p. 57].

Helminthosporium stenospilum [ibid., xiv, p. 530], the causal organism of brown stripe, produces on culture media an ascigerous stage agreeing with that described by Carpenter from Hawaii as a species of *Ophiobolus* [ibid., xi, p. 4], but the writers propose the transference of this species to Drechsler's newly established genus *Cochliobolus* [ibid., xiv, p. 125], characterized by a helicoid ascigerous stage and *Helminthosporium* conidia, as *C. stenospilus*.

The ascigerous stage developing in cultures from 'pokkah-boeng' tissues closely resembles *Gibberella moniliformis* [see above, p. 346] and *G. fujikuroi* [ibid., xiv, p. 709], while the imperfect stage approximates to *F. moniliforme* var. *subglutinans* [*G. fujikuroi* var. *subglutinans*: see above, p. 359] in the production of conidia in false heads.

McINTOSH (A. E. S.) & STEVENSON (G. C.). **Gumming disease investigations in Barbados.**—*Bull. Brit. W. Ind. centr. Sug. Cane Breed. Sta.* 8, 17 pp., 1 graph, 1935.

A summary is given of the results of the gumming disease of sugar-cane (*Bacterium vasculorum*) [*R.A.M.*, xv, p. 317] investigations carried out from 1929 to 1935 in Barbados [ibid., xiv, p. 531]. It appears from the results of reaction tests that nearly all the seedlings derived from crosses between *Saccharum spontaneum* and *S. barberi*, when crossed with members of the species *S. officinarum*, are resistant to the disease. The last-named species was further found to comprise a fair percentage of varieties showing resistance to gumming under local conditions. For

instance, seedlings originating from B. 1379, including B. 6835, B. 417, S.C. 12/4, Ba. 8069, and the female parent of B.H. 10 (12), are markedly resistant. So far, none of the 'noble' cane crosses has yielded progeny with an entire absence of leaf symptoms, and the development of absolute immunity within this group appears scarcely probable, though it is likely that types with sufficient resistance for commercial purposes may ultimately be evolved. The fact that canes, even of susceptible varieties, are rarely killed by *Bact. vasculorum* in Barbados, suggests the possibility of an attenuated degree of virulence in the strain occurring under local conditions in the Island. [A summary of the information here presented is also given in the Report of the Station for the year 1935.]

LUTHRA (J. C.) & SATTAR (A.). **Some observations on the mosaic disease of Sugarcane in the Punjab.**—*Indian J. agric. Sci.*, v, 6, pp. 649–662, 1935.

In the Punjab, sugar-cane affected by mosaic [*R.A.M.*, xiv, p. 257; xv, p. 315, and next abstract] has so far only shown the primary symptoms, no dwarfing or cracking of the stem having yet been observed. The first symptoms occur about 1½ months after planting and continue to develop until October when, as the cane matures, the symptoms become rather obscure. The incidence of mosaic on a number of varieties grown in the years 1927 to 1933 is recorded; the results indicated that while the degree of infection varies from place to place, the varieties Uba, Treru, and Co. 223 were almost totally infected, S. 48, Co. 205, 210, 262, 270, 309, and 349 had more than 20 per cent. infection, and Co. 214, 227, 231, 232, 233, 238, 243, and a number of other varieties were not affected. Three years' field tests showed that on the Co. 223 variety the disease does not significantly reduce the yield of cane, juice, or raw sugar or the quality of the juice. Roguing appears to keep the disease in check only on those varieties that show some resistance.

RAFAY (S. A.). **Physical properties of Sugarcane mosaic virus.**—*Indian J. agric. Sci.*, v, 6, pp. 663–670, 1935.

Using a standardized method of inoculation (by means of 20 entomological pins mounted in a cork pricked through sap into the leaf), the author found that the sugar-cane mosaic virus [see preceding abstract] tolerates a dilution of 1 in 10 but not 1 in 100. The virus loses its potency in two hours, and filtration experiments showed that it was retained even by filter paper, the filtrate being non-infective. Copper sulphate, 1 in 1,500; hydrochloric acid, 1 in 1,000; nitric acid, 1 in 800; hydrogen peroxide, 1 in 25; and formalin, 1 in 50 inactivated the virus; while zinc powder did not affect it. Evidence was obtained that dilute concentrations of the reagents may increase the virulence of the virus.

SYDOW (H.). **Novae fungorum species—XXIII.** [New species of fungi—XXIII.]—*Ann. mycol., Berl.*, xxxiii, 5–6, pp. 367–384, 1935.

Latin and English diagnoses, supplemented by critical notes, are given of 15 new species of fungi collected in Chile, India, Java, the

Philippine Islands, Latvia, and Sweden [cf. *R.A.M.*, xi, p. 474]. *Calendula officinalis* leaves in Latvia bore conspicuous, confluent lesions, 0·5 to 2 cm. diameter, with yellowish-green, later dirty brown centres bordered by a discoloured yellow zone; the depressed-globose pycnidia are 70 to 110 μ in diameter and the hyaline, oblong or oblong-cylindrical uniseptate conidia measure 12 by 3 to 3·5 μ, and are rounded at both ends. The causal organism is named *Ascochyta calendulae* n. sp.

The pale yellow to yellowish-green, elliptical, shrivelled rust (*Melampsora*) spots on willow (*Salix caprea*) leaves [ibid., xv, p. 74] are parasitized by *Colletotrichum socium* n. sp., characterized by rod-shaped to cylindrical conidiophores, 6 to 10 by 2·5 to 3 μ, and oblong to cylindrical or elongated to ellipsoidal, sometimes clavate, straight or slightly curved, continuous, hyaline conidia, rounded at the apex, tapering towards the base, 12 to 20 by 4·5 to 6 μ.

CHABROLIN (C.). **Le cycle évolutif des Urédinées. Revue des travaux sur l'hétérothallisme des Urédinées.** [The evolutionary cycle of the Uredineae. A review of the work on the heterothallism of the Uredineae.]—*Ann. Serv. bot. Tunis*, xi, pp. 273–283, 1935.

In this paper the author gives a succinct account, based on a study of the relevant literature, of the biological and genetical data establishing the existence of heterothallism in the Uredineae [cf. *R.A.M.*, xiii, p. 318 *et passim*], these data then being considered in the light of recent cytological investigations of the fungi concerned. The paper concludes with a short discussion of the importance of the whole question to mycology and phytopathology, and there is a bibliography of 33 titles.

Перечень вредителей и болезней растений внешнего карантина, установленных для СССР. [List of insect pests and diseases prohibited by external quarantine legislation from importation into the U.S.S.R.]—*Publ. НКЗ СССР, Сект. внешн. к внутр. Карант. Растений* 2 [*U.S.S.R. People's Commissariat Agric. Sect. intern. extern. Pl. Quar.* 2], Moscow, 47 pp., 1935.

This is the full official list of the insect pests and plant pathogenic bacterial and fungal organisms, the introduction of which into the U.S.S.R. or into new regions of the Union is prohibited by the 1935 plant quarantine regulations [*R.A.M.*, xv, p. 127]. It is divided into three groups, the first of which comprises all the more dangerous organisms still unrecorded from the country, and includes *Bacterium* [*Pseudomonas*] *citri* (the quarantine against which includes all species and varieties of *Citrus* from countries where the disease is present), *Synchytrium endobioticum* (the entry of all susceptible hosts from infected countries is prohibited), and *Phlyctaena linicola* on flax [but see ibid., xi, p. 45].

The second group comprises organisms doubtfully present or of limited distribution within the U.S.S.R. Their host plants are not absolutely debarred from entry into the country, but the presence of any of the organisms on a single specimen entails the rejection or even the destruction of the whole consignment. These organisms are *Bact.* [*P.*] *citriputeale* on oranges, lemons, and tangerines; *Aplanobacter michiganense* on tomatoes; *Bact. flaccumfaciens* on beans (*Phaseolus vulgaris*

and *P. lunatus*); *Bact. medicaginis* var. *phaseolicola* on beans; *Bacillus amylovorus* on all the susceptible hosts; *Bact. translucens* and *Bact. atrofaciens* on cereals; *Bact. mori* on mulberry; *Sclerotium rolfsii* on all its hosts; *Phoma lingam* on crucifers and beet; *Spongospora subterranea* [ibid., xii, p. 589; xiv, p. 330] on potato and tomato; *Sporotrichum citri* on *Citrus*; *Dibotryon morbosum* on stone fruit trees and material; *Endothia parasitica* on chestnut, oak, maple, *Garya*, and *Rhus* spp.; *Phymatotrichum omnivorum* [ibid., xi, p. 42] on all of its numerous hosts; *Ceratostomella fimbriata* on species of *Ipomoea*; *Macrophoma edulis* on sweet potato; *Diplodia tubericola* on its hosts; *Fusarium batatatis* [*F. bulbigenum* var. *batatas*] on sweet potato; *F. hyperoxysporum* on sweet potato; *Tilletia pančičii* on barley; *T. horrida* on rice; *Urocystis tritici* on wheat; *Uromyces betae* on beet [ibid., xii, p. 560].

The third group consists of organisms the presence of which on imported plants requires the disinfection of the whole consignment which may be directed to certain ports of entry, as regulated for each individual case, namely: *Bacterium tumefaciens* on all of its known hosts; *Fusarium conglutinans* on cabbage, asters, turnips, and beet; *Sorosporium reilianum* on maize and sorghum; and *Urocystis cepulae* on all species of *Allium*.

In every case the world distribution of the organisms, so far as it is known, is fully indicated.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, vii, 10, pp. 212–217, 1935.

ESTHONIA. A Decree of 9th October, 1935, defines the nature and scope of the measures to be taken with a view to combating plant diseases and pests and the duties of heads of institutions, agricultural and horticultural establishments, and the like, and of landowners on whom the execution of the necessary work of eradication and control devolves. The Minister of Agriculture is empowered to make orders for the carrying out of this Decree. The Order of 1932 requiring the destruction of buckthorn [*Rhamnus cathartica*] and barberry [*Berberis vulgaris* and its var. *atropurpurea*; *R.A.M.*, xii, p. 800] is hereby superseded.

British Honduras. Statutory Rules and Orders. 1936, No. 15. Proclamation prohibiting the importation of Grapefruit and Orange plants, except under certain conditions—2 pp., 1936.

This proclamation provides that the importation of citrus plants into British Honduras shall only be effected through the Department of Agriculture, the selection of the nursery from which any plants are obtained being in the discretion of the Agricultural Officer. Trees of each consignment after planting shall be open to inspection at any time, and within three years the owner may be required to destroy or spray any tree affected by any harmful disease believed to have been introduced thereon. All material used in packing is to be burnt after unwrapping the trees at their destination.

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XV JULY 1936

HIRATSUKA (N.). **Phakopsora of Japan I, II, III.**—*Bot. Mag., Tokyo*, xlix, 587, pp. 781–788; 588, pp. 853–860, 1935; l, 589, pp. 2–8, 1936.

The following items are of special interest in this critical discussion, supplemented by fungus and host indexes, of the twelve species of *Phakopsora* (the distribution of which is shown in tabular form) studied by the author in Japan. *P. pachyrhizi* (synonyms of which are considered to include *P. sojae* Saw., *Uredo sojae* P. Henn. [*R.A.M.*, xiii, p. 398], *Uromyces sojae* Miura non Sydow [ibid., vi, p. 74], and *P. vignae* Arthur in *N. Amer. Fl.*, vii, p. 673, 1925) has been found widely distributed throughout the northern Provinces on soy-beans, *Glycine ussuriensis*, *Pachyrhizus bulbosus* [*P. erosus*], and *Pueraria thunbergiana*, the last-named host apparently constituting a new record for the rust. The fungus has also been reported from the West Indies, Java, the Philippines, and Manchuria.

P. zizyphi-vulgaris has been observed on *Paliurus ramosissimus* [*R.A.M.*, xiv, p. 719] and *Zizyphus vulgaris* var. *inermis* in Formosa, while specimens have also been examined on *Z. vulgaris* var. *spinosus* from China and Manchuria and on *Z. sativa* from China.

P. ampelopsidis (syn. *P. vitis*) [ibid., iv, p. 655; vi, p. 460; x, p. 343] occurs on *Ampelopsis heterophylla* [*Parthenocissus tricuspidata*], *Vitis coignetiae*, *V. flexuosa*, and cultivated vines in various parts of Japan, and has also been reported from North and South America, the West Indies, and the Philippines.

GOTO (K.). **Sclerotium rolfsii Sacc. in perfect stage. III. Variation in the cultures originated from basidiospores.**—*J. Soc. trop. Agric. Taiwan*, vii, pp. 331–345, 3 figs., 1 diag., 1935.

Some of the numerous monobasidiosporous isolations from the *Corticium* stage of *Sclerotium rolfsii* [*R.A.M.*, xiv, p. 387; xv, p. 324] examined by the writer at the Taihoku Imperial University, Formosa, were found to fall within the limits of variation of the species, while the remainder were so aberrant as to be barely recognizable as the same fungus. From matings in all possible combinations between these aberrant isolations, several strains apparently identical (apart from certain variations in cultural characters and growth rate) with *S. rolfsii* in its typical form were obtained, thereby affording presumptive

evidence of heterothallism in the species. When sectorial strains were isolated from the colonies derived from mass sowing of basidiospores of the Indian and American, as well as Formosan strains, and compared with the original, a proportion varied similarly to the foregoing. By means of Nakata's aversion criterion [ibid., vi, p. 55] it was ascertained that a few of the aberrant strains showed marked repulsion when tested against the original, while most of the remainder exhibited a similar phenomenon in a slighter degree. The sectorial strains may therefore be considered as distinct strains of *S. rolfsii* in the usual sense of the word.

On the basis of these data the spontaneously developing natural strains of the fungus are interpreted as heterozygous clones. It is further suggested that the recombination of hereditary factors in the course of sexual reproduction may be an important cause of variation in nature.

Wolf (F. A.). **Tobacco diseases and decays.**—xix+454 pp., 1 pl., 106 figs., 5 graphs, Durham, North Carolina, Duke University Press, 1935. Price $5.

In this book, the first devoted solely to the subject in the English language, the author gives a concise, comprehensive account of the diseases of the tobacco plant occurring in all parts of the world when the crop is cultivated, and of the decays of the harvested product. After an introductory chapter comprising brief, semi-popular notes on diseases of plants in general and of tobacco in particular, an outline of the classification of *Nicotiana*, and an historical sketch of the origins of the plant, the writer discusses seed-bed sanitation in relation to tobacco diseases. Then follow chapters on nutritional diseases (some 30 pp.), diseases due to unfavourable water relations, little known and non-infectious disorders and diseased conditions, virus diseases (86 pp.), bacterial diseases (57 pp.), fungous diseases of the growing crop (105 pp.), diseases caused by nematodes, diseases caused by parasitic phanerogams, and decays during curing, fermentation, and storage, and after manufacture.

In general, an attempt has been made to describe the symptoms of each disease, then to consider its cause, the factors favouring its development and dissemination, and finally control measures. Citation is made of pertinent literature with each disease and a bibliography (down to 1934) of some 50 pages is appended. The publication of this volume adds a further welcome and most useful contribution to the series of monographs dealing with diseases of special crops.

Van der Weij (H. G.). **Ziekten der Tabak.** *Ex* **Overzicht van de ziekten en plagen der Deli-Tabak in het jaar 1935.** [Tobacco diseases. *Ex* Survey of the diseases and pests of Deli Tobacco in the year 1935.]—*Meded. Deli-Proefst.*, Ser. 2, xciii, pp. 3–11, 1936.

During the period under review it was necessary to break up 54,837 tobacco seed-beds on the estates under the supervision of the Deli Experiment Station on account of slime disease (*Bacterium solanacearum*) compared with 39,317 in 1934 [*R.A.M.*, xiv, p. 658], the average incidence of infection being 10·6 as against 8·4 per cent. in the

previous year. In four plantations belated infection by *Bact. solanacearum* resulted in hollow stalks. Stem scorch caused by *Rhizoctonia* [*Corticium*] *solani* [ibid., x, p. 276; xiii, p. 61] was prevalent in the field, inducing symptoms reminiscent of slime disease, with which it has no doubt been confused. *Cercospora nicotianae* [ibid., xiv, p. 473] was somewhat more in evidence than in 1934, chiefly on black dust soils. Notes are also given on the virus diseases mosaic ('peh sim'), Rotterdam B, 'gilah', 'korab', ring spot, and 'daon lidah', on miscellaneous physiological and climatological disturbances, and on disorders affecting tobacco during the processes of curing and fermentation, including a few cases of infection by *Oospora nicotianae* [ibid., viii, p. 75].

MATSUMOTO (T.) & HIRANE (S.). **Immunological studies of mosaic diseases. V. Micro-serological tests as means of detecting the virus in a small area of mosaic Tobacco plants.**—*J. Soc. trop. Agric. Taiwan*, vii, pp. 346–350, 2 figs., 1935.

A brief description is given of a method devised by the writers for the determination of the concentration of the tobacco mosaic virus [*R.A.M.*, xiv, p. 402] in small areas of the infected tissue. About 0·05 c.c. of undiluted (or 1:2) anti-mosaic serum is introduced by means of a fine capillary pipette into small tubes (about 3 mm. external diameter) and roughly the same quantity of ground, centrifuged plant extract at dilutions of 1:10, 1:20, 1:40, or 1:80 gently added in such a way as to leave a zone between the two constituents. After one hour's incubation at 37° C. the determinations were made by noting the presence or absence, as well as the extent, of the flocculence or precipitate at the zone of contact. For the preparation of the extract only 0·05 to 0·1 gm. of plant material was required.

The infective principle was found to accumulate more abundantly in the pale than in the dark green areas of mosaic foliage and in the roots than in the stems, though it is pointed out that these observations require confirmation by parallel inoculation tests.

DUGGAR (B. M.) & HOLLAENDER (A.). **Inactivation of the virus of typical Tobacco mosaic and of Escherichia coli in the shorter ultra-violet.**—Abs. in *J. Bact.*, xxxi, 1, p. 52, 1936.

A highly purified, stirred suspension of the typical tobacco mosaic virus was irradiated in the presence of *Escherichia* [*Bacillus*] *coli* with measured quantities of monochromatic ultra-violet rays from λ 2,250 to 3,000 Å., the experiment being so performed as to enable the relative resistance as well as the wave-length dependence of both organisms to be compared [cf. *R.A.M.*, xiii, p. 541]. It was found that the amount of energy necessary to destroy 50 per cent. of the virus in suspension (physiological salt solution) at λ 2,250 Å. is only one-fifth of that requisite at 2,650 Å., whereas the amount needed for the inactivation of *B. coli* in the same suspension is higher at 2,250 than at 2,650 Å. [cf. ibid., xv, p. 4].

GRAINGER (J.). **Low-temperature masking of Tobacco mosaic symptoms.**—*Nature, Lond.*, cxxxvii, 3453, pp. 31–32, 1 fig., 1 graph, 1936.

On 5th October, 1934, six young tobacco plants with mosaic symptoms

were placed in a cool greenhouse until 16th November, by which time three apparently healthy new leaves had been formed on each. The plants were then transferred to a fully illuminated glass chamber at 75° F., under which conditions mosaic symptoms developed within seven days on the new growth made above the masked foliage [cf. *R.A.M.*, xii, p. 581], the latter remaining apparently sound. All the plants were afterwards removed to the cool house (mean temperature 51°, maximum 57°), where they made further growth without any obvious sign of mosaic. Similar results were obtained in 1935 with five plants maintained at a mean temperature of 45°; on another five kept at 55° faint mottling occurred. Under local (Huddersfield) conditions the plants grow most rapidly at 75°, whereas the virus apparently travels with maximum velocity between 75° and 85° [ibid., xii, p. 792].

STANLEY (W. M.) & LORING (H. S.). **The isolation of crystalline Tobacco mosaic virus protein from diseased Tomato plants.**—*Science*, N.S., lxxxiii, 2143, p. 85, 1936.

Using an improved procedure based on that previously employed for the isolation of a crystalline protein from mosaic tobacco [*R.A.M.*, xiv, p. 721], the writers obtained from tomato plants infected by the tobacco mosaic virus a substance with the same crystalline form, optical activity, and chemical composition. At a reaction of greater alkalinity than P_H 11 or more acid than P_H 1 the protein is denatured and the virus activity lost, a similar result, with coagulation, following heating to 94° C. The isoelectric point of the crystals from both tobacco and tomato plants was ascertained by cataphoresis tests to be about P_H 3·2. At hydrogen-ion concentrations more alkaline than P_H 3·2 the crystals from both sources migrate to the positive electrode, whereas at more acid reactions they proceed to the negative one.

There appeared to be little difference in the virulence of the proteins from tobacco and tomato with the half-leaf method of inoculation, 1 c.c. of a solution containing only 10^{-9} gm. of the crystalline substance from either source usually proving infectious. The protein from mosaic tomatoes in solution at a strength of 10^{-5} gm. and upwards per c.c. gives a precipitate when mixed with the sera of animals previously injected with either the crystalline substance from diseased tobacco plants or the juice from such plants. The isolation from a different host of a protein possessing the same properties as that from mosaic tobacco is considered to afford fresh evidence for the identity of the protein with the agent responsible for the disease.

BEST (R. J.). **The effect of environment on the production of primary lesions by plant viruses.**—*J. Aust. Inst. agric. Sci.*, i, 4, pp. 159–161, 1935.

In these studies the effect of temperature and light on the number and development of primary lesions produced by the viruses of tomato spotted wilt and ordinary tobacco mosaic was investigated [*R.A.M.*, xiv, p. 781]. Using the former virus inoculated on tobacco, it was found that lesion development is inhibited by bright sunlight or by controlled artificial light. In the case of tobacco mosaic on *Nicotiana glutinosa*, more primary lesions develop under glasshouse conditions than in the

laboratory, and controlled experiments showed that provided the light available is sufficient for normal growth the difference is a temperature effect. Under comparable conditions, 2,932 lesions developed at 20° C. and 2,253 at 15°, a difference which is highly significant. Discussing the dilution curve for tobacco mosaic, the author states that the physiological age of the test plants and the conditions under which the lesions develop appear to have an effect on the range over which the straight line (middle portion) obtains. The curve for tomato spotted wilt is like that of tobacco mosaic, except that at high dilutions the slope of the curve depends upon conditions prevailing whilst the lesions are developing, and also upon the time elapsing between the first appearance of the lesions and the time of counting. The tendency of lesions to form near the lateral veins points to the possibility that the critical infective unit (possibly amounting to some millions of virus particles) may be smaller in the neighbourhood of the veins.

Röder (K.). **Untersuchungen über die Phytophthorakrankheit (Phytophthora infestans) der Tomate. Unter besonderer Berücksichtigung der biologischen Spezialisation des Erregers.** [Studies on the *Phytophthora* disease (*Phytophthora infestans*) of the Tomato, with particular reference to biologic specialization in the causal organism.]—*Phytopath. Z.*, viii, 6, pp. 589–614, 9 figs., 1935.

From the results of this fully tabulated account of the writer's studies on late blight of tomatoes (*Phytophthora infestans*) [*R.A.M.*, xv, p. 324] at the Biological Institute, Berlin-Dahlem, it appears that the course of the disease in the foliage is similar to that pursued by the fungus in potato leaves. The germ-tubes of the zoospores penetrate the uninjured epidermal cells and proceed thence into the intercellular system, the incubation period ranging from four to six days. On tomato leaves, however, the fungus does not fructify quite so luxuriantly as on those of the potato. The epidermis of the fruit is an insuperable obstacle to penetration by *P. infestans* unless the tissues are wounded, in which case direct entry is practicable. Usually the organism is reduced to indirect means of ingress through the pedicel and calyx leaves. The small, brown spots formed on the epidermis converge, sink inwards, and may eventually cover the whole fruit. Except in the case of injured fruits the fructifications of the fungus are much sparser on these organs than on the leaves.

At least two biologic forms of *P. infestans* may be differentiated on the tomato. One ('T') showed an excessively high degree of virulence towards all the varieties used in the tests, almost completely destroying 50- to 60-day-old plants within 10 to 12 days. The other ('L'), which is thought to be probably identical with the 'A' group from potato [ibid., xiv, p. 390], ceased to develop after producing dry spots on the leaves. Neither 'T' nor 'L' is capable of penetrating the uninjured epidermal tissues of the tomato fruit, but once arrived in the interior of the latter both develop profusely. The 'A' and 'S' forms of *P. infestans* from potato behaved similarly to 'L' on the tomato, while the reactions induced by the latter in cultivated potatoes (Ackersegen, Erstling [Duke of York], Industrie, Parnassia, Preussen, and Wohltmann) and the W types resembled those called forth by 'A'. Hence it

would appear that the 'L' form of *P. infestans* from tomato is identical with the potato biotype 'A'.

None of the 81 cultivated tomato varieties tested gave any marked indication of resistance to the 'T' or 'L' forms, while the former also virulently attacked the closely related *Solanum racemigerum*, *S. racemiflorum*, *S. humboldtii*, and *S. tomatillo*. For the time being, therefore, the prospects of breeding for immunity from late blight in tomatoes are not very encouraging, and American reports of resistant varieties should not be too readily accepted.

SIMMONDS (J. H.). **Diseases of the Tomato.**—*Qd agric. J.*, xlv, 1, pp. 5–11, 7 figs., 1936.

Brief, popular notes are given on the symptoms and control of the following tomato diseases occurring in Queensland, viz. *Phytophthora infestans* [see preceding abstract], *Septoria lycopersici* [*R.A.M.*, xv, p. 65], *Alternaria solani* [ibid., xv, p. 265], *Bacterium solanacearum* [ibid., xiv, pp. 337, 686], *Fusarium* [*bulbigenum* var.] *lycopersici* [ibid., xiv, p. 498 and next abstract], *Verticillium albo-atrum* [ibid., xiv, p. 283], mosaic [ibid., xv, p. 181], spotted wilt [ibid., xv, p. 324], 'big bud' [ibid., xv, p. 182], streak [ibid., xiv, p. 348], and blossom-end rot [ibid., xiv, p. 800]. The paper concludes with a brief list of routine measures recommended for controlling tomato diseases.

FISHER (P. L.). **Physiological studies on the pathogenicity of Fusarium lycopersici Sacc. for the Tomato plant.**—*Bull. Md agric. Exp. Sta.* 374, pp. 261–281, 10 figs., 1935. [Abs. in *Exp. Sta. Rec.*, lxxiv, 3, pp. 357–358, 1936.]

Bonny Best and Marglobe tomatoes, the former susceptible and the latter comparatively resistant to *Fusarium* [*bulbigenum* var.] *lycopersici* [*R.A.M.*, xiii, p. 218 and preceding abstract] under normal conditions of cultivation, were grown in solutions with an excess or deficiency of boron, calcium, magnesium, potash, nitrogen, phosphorus, and sulphur and inoculated with the fungus. In both varieties resistance was increased by deficiencies of boron, nitrogen, and sulphur and susceptibility enhanced by excesses of these elements. Resistance in Bonny Best was also strengthened by deficiencies of magnesium and phosphorus and excesses of calcium, magnesium, and phosphorus; potash deficiency increased resistance and excess caused no change in the susceptibility of this variety. In the case of Marglobe resistance was reduced by deficiencies of calcium and potash and excess of the latter, but increased by both deficiencies and excesses of magnesium and phosphorus.

The results of greenhouse plot trials indicated that heavy applications of lime accompanying a well-balanced fertilizer (e.g., 4–10–6) would be of practical utility in the reduction of wilt infection.

Thermostable toxic properties were found to reside in filtrates from 18-day-old cultures and extracts from fungal mats [ibid., xiv, p. 310]. Untreated Marglobe juice inhibited the growth of *F. bulbigenum* var. *lycopersici* in pure culture, but autoclaving or ultrafiltration destroyed this effect, which was not exerted by Bonny Best juice.

KOCHMAN (J.). **Brunatna pleśń Pomidorów—Cladosporium fulvum Cooke i jej zwalczanie.** [Tomato leaf mould—*Cladosporium fulvum* Cooke, and its control.]—*Roczn. Nauk ogrod.*, ii, pp. 81–94, 2 figs., 1935. [English summary.]

This is a brief, semi-popular account of the morphology and biology of *Cladosporium fulvum* [*R.A.M.*, xv, p. 324], which is stated to have been found for the first time in Poland in 1930, since when it has been observed, sometimes in epidemic form, in several localities of that country, both in glasshouses and in the field, causing serious damage to the crop. Control experiments indicated that the best results are obtained by spraying the growing plants under glass and in the open with 1 in 60 lime-sulphur. Infected glasshouses should also be thoroughly sprayed with lime-sulphur before setting out tomato seedlings in them.

SIEMASZKO (W.). **Choroba naczyniowa Wiązów Ceratostomella (Graphium) ulmi (Schwarz) Buisman w Polsce.** [The vascular disease of the Elm, *Ceratostomella* (*Graphium*) *ulmi* (Schwarz) Buisman, in Poland.]—*Roczn. Nauk ogrod.*, ii, pp. 163–172, 1 pl., 1 fig., 1935. [English summary.]

The author states that the Dutch elm disease (*Ceratostomella ulmi*) in Poland [*R.A.M.*, xiv, p. 264; xv, p. 328] was first officially recorded in 1935 in Pomerania on old *Ulmus campestris* trees planted on the banks of the Vistula, the latter three annual rings of which showed the discoloration characteristic of the disease. In the same year the fungus in its coremial and *Cephalosporium*-like stages was also found in dead twigs on old *U. montana* trees in the Warsaw Botanic Garden, which were severely attacked by bark borers (*Scolytus scolytus* and *S. multistriatus*); these beetles are also prevalent on elms in Pomerania. The morphology and biology of the fungus are briefly described from literature.

MARTÍNEZ (J. B.). **La grafiosis del Olmo y la demostración de su existencia en España.** [Graphiosis of the Elm and the demonstration of its existence in Spain.]—Issued by Inst. for. Invest. Exp., La Moncloa, Madrid, ix, 15, 29 pp., 6 pl., 1936. [German and French summaries.]

In the first part of this paper a general account of the die-back of elms caused by *Ceratostomella ulmi* [see preceding abstract] is given, while in the second particulars are furnished of the detection of the disease in Spain and the cultivation of the causal organism, the identity of which was confirmed by Prof. J. Westerdijk. Suspicious symptoms were first observed near Madrid on *Ulmus campestris* in 1932, but the attempted isolation of a pathogen from the affected branches, which presented all the external, internal, and histopathological features of a tracheomycosis, gave negative results. In 1935, however, *C. ulmi* developed in potato juice agar cultures from similarly affected trees near Burgos. This is a new record for Spain, which must now be added to the list of countries [*R.A.M.*, xiv, p. 264] known to harbour the elm pathogen.

Gilman (J. C.), McNew (G. L.), & Davis (G. N.). **Fungi associated with tree cankers in Iowa. I. Preliminary survey.**—*Iowa St. Coll. J. Sci.*, x, 2, pp. 151–153, 1936.

With the aid of the Civilian Conservation Corps in Iowa, material was collected from standing trees in parks and shelter belts, showing the early stages of decline with a view to the determination of the causal organisms of cankers. The 213 identifiable species of fungi occurring on 713 of the 860 specimens of ten hosts examined were distributed in 87 genera, the more common species being *Scoleconectria scolecospora* on *Pinus strobus*, *Valsa pini* [*R.A.M.*, ix, p. 205] and *Cytospora pinicola*, possibly the conidial stage of the foregoing, both on the same host, *C. annularis* on green ash (*Fraxinus pennsylvanica* var. *lanceolata*), *Sphaeropsis ellisii* [cf. below, p. 412] on *P. strobus* and *P. sylvestris*, and *C.* [*V.*] *nivea* [ibid., xv, p. 162] on *Populus alba*, *P. deltoides*, and *P. tremuloides*. Few data are available at present regarding the parasitism of the fungi involved but they appear to be chiefly secondary invaders following other injuries.

Servazzi (O.). **Ricerche sulla preservazione dalle muffe delle Castagne disinfestate con l'immersione in acqua a 50° C. per 45′.** [Researches on the preservation from moulds of Chestnuts disinfected by immersion in water at 50° C. for 45 minutes.]—*Difesa Piante*, xii, 6, pp. 191–203, 1935.

Further studies conducted at Turin to determine the best methods for the pre-shipment treatment of export chestnuts from Piedmont [*R.A.M.*, xiii, p. 65; xiv, p. 801] showed that the hot-water treatment [loc. cit.] against insects predisposes the fruits to mould infection, over-mature fruits becoming infected sooner than others. The best conditions for preservation occur when the drying eliminates all the water absorbed during the treatment (from 2·5 to 15 per cent.). To secure this result the temperature and period of drying must be varied to suit the variety of chestnut being treated. If the chestnuts are left in water for periods ranging from 2 to 12 days before hot-water treatment at 50° C. for 45 minutes, the development of internal moulds is prevented but no effect is produced on the external moulds. The addition to the water of various fungicides, including formaldehyde, gave negative or inconclusive results, though internal mould development was to a certain extent prevented or retarded by silver fluoride at a strength of 1 in 500,000.

Allain (A.). **Contribution à l'étude du Phytophthora cambivora. Morphologie, cytologie et action pathogène du parasite.** [A contribution to the study of *Phytophthora cambivora*. The morphology, cytology, and pathogenic action of the parasite.]—127 pp., 16 pl. (2 col.), 18 figs., Paris, Typographie Firmin-Didot et Cie., 1935.

In this paper the author gives the results of his detailed study on the morphology, cytology, and parasitic action of *Phytophthora cambivora* [*R.A.M.*, xiii, pp. 65, 603; xv, p. 378]. He found that sporangia of the fungus were produced most freely on Petri's synthetic mineral solution [ibid., iv, p. 133] but also in a solution containing 0·2 per cent.

ammonium nitrate and in Knop's solution. Sexual organs were numerous in 15 to 30 days on Petri's synthetic medium solidified with 2 per cent. agar and developed freely also on an agar made with the solution diluted $\frac{1}{2}$ to $\frac{1}{32}$, as well as on distilled water agar after 15 to 25 days. Their production seemed to be favoured by exposing the cultures to considerable changes of temperature (23° C. by day, 13° by night) at regular intervals.

Most of the antheridia are amphigynous [cf. loc. cit.]; some of the oogonia have no antheridium and may possibly develop parthenogenetically, and one antheridium was observed adhering to the side of the oogonium, suggesting the paragynous position.

While in the chestnut *P. cambivora* produces a blackening of the tissues, followed by a secretion of black liquid, in experimentally inoculated lupins it caused only a yellow or brown discoloration; in both hosts there was distinct hyperplasia at the inoculation site. In both, mycelial swellings [ibid., x, p. 123] were formed and the fungus was present both intra- and intercellularly, according to the cell resistance which appeared to be increased by an abundance of starch grains. The cytological changes resulting from infection took the form of disintegration of the chloroplasts, digestion of starch grains, agglomeration of the oil drops present in healthy cells, and, in the lupin, of the appearance of tannins in the tissues. The presence of tannins in infected chestnuts does not appear to be due to the fungus, as healthy chestnut tissues contain them in large quantities. The break-up of the vacuolar system was more marked in chestnut than in lupin cells. In both the chondriome finally assumed the form of granules. Complete nucleolysis was more commonly observed in affected chestnut than in affected lupin cells.

A close morphological and cytological similarity exists between *P. cambivora* and *P. erythroseptica* [ibid., xiii, pp. 180, 531]. The sporangia and intercalary bodies produced by both are identical, as are the oospores and the manner of their development. The most marked difference is that with *P. erythroseptica* oogonia are very easily obtained in culture while with *P. cambivora* their production is secured only with great difficulty. Cytological details are given of the mycelium and the sexual organs.

A bibliography of 28 pages is appended.

HEPTING (G. H.) & BLAISDELL (DOROTHY J.). **A protective zone in Red Gum fire scars.**—*Phytopathology*, xxvi, 1, pp. 62–67, 2 figs., 1936.

Of seven hardwoods studied in a recent pathological investigation in the Mississippi Delta, red gum (*Liquidambar styraciflua*) and persimmon (*Diospyros virginiana*) appeared to be the most resistant to decay through fire scars, the former showing only 42 and the latter 20 per cent. infection compared with 100, 82, 80, 72, and 47 per cent. in hackberry (*Celtis laevigata*) [Willd. = *C. mississipiensis* Bosc], oaks (*Quercus nuttallii*, *Q. lyrata*, and *Q. nigra*), and ash (*Fraxinus* spp.), respectively. Shortly after scarring the two resistant species form hard, dark zones on the surfaces of the scars, extending to a depth of 2 to 10 mm. into the wood.

A detailed study was made of the protective zone in *L. styraciflua*,

from which it appears that several outer layers of sapwood cells are usually involved, and that the cells within the zone are heavily infiltrated with a brown, gum-like substance nearly filling the lumina of the fibres and occurring in considerable amounts in the largest vessels. Inoculation experiments under controlled conditions on autoclaved blocks of red gum ¼ in. sq. and ½ in. long, each block including part of the protective zone and adjacent sapwood, with *Polyporus* [*Polystictus*] *pergamenus* [*R.A.M.*, xi, p. 275] and *Polyporus gilvus* [ibid., xiv, p. 795] gave completely negative results as regards the gum-filled zone, which was as hard and firm after a year's exposure to fungal action as at the outset of the trial, whereas the normal sapwood was heavily attacked by both fungi and crumbled at the least pressure. It would seem that the gum-filled protective zone may preserve the underlying sapwood from desiccation and subsequent decay for lengthy periods, many cases having been observed in which large fire scars on *L. styraciflua* have entirely healed without any rotting of the area behind them. Repeated exposure to the action of fire, however, may destroy the protective zone and thus afford ready ingress to invading fungi or insects. The supplementary function of the gum-filled zone as a mechanical barrier to the fungal mycelium must also be borne in mind.

Kheswalla (K. F.). **Seedling blight of Cinchona ledgeriana Moens caused by Phytophthora palmivora Butl. in the Darjeeling district.**—*Indian J. agric. Sci.*, v, 4, pp. 485–495, 1 col. pl., 1935.

Cinchona ledgeriana seedlings in Darjeeling became affected in 1928 by a serious blight. A discoloration began at the collar and spread to the cotyledons, which became limp and bent over. The leaves turned yellow, curled inwards, and were occasionally shed. Rotting ensued, and when the bark tissues had begun to decompose and the inner vascular regions had become affected the seedlings hung down from the affected part and died. Several seedlings died from the top downwards, indicating that infection can also be air-borne.

Affected material showed the presence of a *Phytophthora* identified as a strain of *P. palmivora* [*R.A.M.*, xiii, p. 812]. As the fungus did not form oospores in culture paired cultures were made with *P. colocasiae*, *P. parasitica*, *P. meadii*, and *P. palmivora*, respectively [ibid., xv, p. 378], and also by growing together monosporangial isolates from diseased cinchona plants. In the latter set of paired cultures no oospores were found, while in the former they were obtained with all the fungi used, except *P. meadii*, at 22° C.

The optimum temperature for growth of the fungus was about 24°, and the maximum between 32·5° and 35°. Inoculations of the stems and leaves of cinchona seedlings with pure cultures of the fungus gave positive results, the organism being reisolated. It was also pathogenic to leaves of castor [*Ricinus communis*] and palm, whereas *P. parasitica* and *P. colocasiae* were unable to infect cinchona seedlings, though a strain of *P. palmivora* did. Statistical comparison of the dimensions of the stalked sporangia of the cinchona fungus and those of *P. palmivora* showed the former to average $33{\cdot}3 \pm 0{\cdot}39$ by $17{\cdot}6 \pm 0{\cdot}19\ \mu$, agreeing with the latter in length but being a little narrower.

Furtado (C. X.). **A disease of the Angsana tree.**—*J. Malay. Br. Asiat. Soc.*, xiii, 2, pp. 163–192, 1935.

After briefly outlining the history of an obscure disease of the 'angsana' tree (*Pterocarpus indicus*, a very popular avenue tree throughout the Malay Peninsula), which was first recorded in the seventies of last century in Malacca, whence it has since spread to other parts of Malaya, the author gives the results of his own studies of the trouble since 1923. The disease is characterized by an initial withering and death of young branches bearing leaves and fruits, followed by a rapidly developing die-back of the larger branches and finally the death of the whole tree within two or three months from the first appearance of the symptoms. Sometimes an attempt at recovery is made by the formation of shoots from near the base. Mycological examination of dead angsana wood revealed the presence of several Basidiomycetes, and most frequently of *Schizophyllum commune* [cf. *R.A.M.*, xiii, p. 641]. *Dothidella pterocarpi* was also frequently found causing brown patches and holes in living leaves, but did not appear to have any serious effect on the tree. Attempted isolations from diseased living tissues gave negative results.

Following a survey of the various theories regarding the cause of the disease, the author suggests that it may be caused by a Jassid, the activity of which apparently interferes with the physiology of the tree, bringing about death. Possible means for the control of the disease are very briefly indicated.

Dimitroff (T.). Приносъ къмъ изучване насѣкомнитѣ и гѫбнитѣ вредители на нашитѣ гори и горски култури. [Contribution to the study of the insect pests and fungal diseases of our natural and cultivated forests.]—*Annu. Univ. Sofia*, xiii, pp. 220–252, 10 figs., 1935. [French summary.]

In an introduction to this paper the author states that, owing to favourable ecological conditions, the natural forests of Bulgaria are very resistant to the attacks of insects and fungal diseases, but with the introduction of silvicultural methods, aided by predatory systems of forest exploitation, together with considerable damage done by fire, the health standard of the forests is rapidly declining; recent surveys have resulted in the recording of 21 species of pathogenic fungi, the relative importance of which increases from year to year. The following species may be mentioned. *Aecidium elatinum*, the aecidial stage of *Pucciniastrum* [*Melampsorella*] *caryophyllacearum* [or *M. cerastii*: *R.A.M.*, ix, p. 602; xii, p. 666] is widespread on firs in the whole country, especially in the form of stem cankers, and causes considerable losses. *P. padi* [*Thecopsora areolata*: ibid., xiii, p. 313] was very prevalent in 1934 in the State forestry of Tcham-koria on spruce cones, considerably reducing the germinability of the seeds contained in them. This tree is also widely attacked by *Chrysomyxa abietis* [ibid., ix, p. 205], and *Lophodermium macrosporum* [ibid., xiii, p. 666] which, in seasons following a mild and rainy winter, frequently attains epidemic proportions. The Basidiomycetes listed include *Lenzites sepiaria* [ibid., xv, p. 332], *Polyporus borealis* [ibid., xiv, p. 803], and *P.* [*Fomes*] *hartigii* [ibid., xv, p. 68]. *Vaccinium vitis-ideae* in the Tcham-koria forestry was found to be infected with *Pucciniastrum goeppertianum*

[ibid., ix, p. 602; xii, p. 666], and may serve as a source of infection of firs with the fungus.

MIELKE (J. L.). **Rodents as a factor in reducing aecial sporulation of Cronartium ribicola.**—*J. For.*, xxxiii, 12, pp. 994–1003, 1 fig., 1935.

In western North America various rodents have been observed to feed on the portions of white pine (*Pinus monticola*) bark attacked by *Cronartium ribicola* [*R.A.M.*, xv, p. 330], mostly during the late winter and early spring, when other foods are scarce. Well-matured cankers appear to be preferred. For most of the older blister rust infection centres in the western States it is estimated that rodents have removed 10 to 35 per cent. of the aecidia-bearing bark and thus effected a considerable reduction in the volume of spores for dissemination to the alternate (*Ribes*) hosts.

GOIDÀNICH (G.). **Le alterazione cromatiche parassitarie del legname in Italia. II. Una intensa colorazione del legno di Pino causata da Sphaeropsis ellisii Sacc., var. cromogena G. Goid. var. n.** [Parasitic staining of timber in Italy. II. An intense discoloration of Pine wood caused by *Sphaeropsis ellisii* Sacc. var. *cromogena* G. Goid. var. n.]—*Boll. Staz. Pat. veg. Roma,* N.S., xv, 3, pp. 442–470, 4 pl., 15 figs., 1935.

This paper describing the disease of *Pinus pinea* caused in Italy by *Sphaeropsis ellisii* var. *cromogena* is an expanded version of one already noticed from another source [*R.A.M.*, xiv, p. 727].

BUCHWALD (N. F.). **En ny svampesygdom i Danmark. Didymascella thujina paa Thuja plicata.** [A new fungous disease in Denmark. *Didymascella thujina* on *Thuja plicata.*]—*Dansk Skovforen. Tidsskr., 1936*, pp. 51–59, 4 figs., 1936.

Branches of *Thuja plicata* in a Danish nursery were observed in October, 1935, to bear on the reddish-brown discoloured needles the small, circular to elliptical, olive-brown or nearly black, cushion-shaped apothecia of *Didymascella thujina* [*R.A.M.*, xiv, p. 794], with asci containing two broadly ellipsoid, dark olive, finely verrucose ascospores, 22 to 25 by 15 to 16 μ, unequally divided into two cells of which the upper is much the smaller. The ascospores are liberated from June to October, during which period infection takes place and among one- to four-year-old nursery trees the disease is liable to assume an epidemic character. It is possible that *D. thujina* was introduced into Denmark with a consignment of seed from British Columbia, but more likely, in the writer's opinion, that it has been present for some time in the country without attracting attention, the symptoms on the few older (15 years) trees affected being quite inconspicuous. Control measures should be based on the eradication of diseased individuals, supplemented by spraying with Bordeaux mixture.

Diseases and pests of the Bermuda Cedar.—*Agric. Bull. Bermuda*, xiv, 12, pp. 93–95, 1935.

The most interesting disease of the Bermuda cedar [*Juniperus bermudiana*] is the rust caused by *Gymnosporangium bermudianum* (Farl.)

Earle, which produces small, rounded galls on the twigs. At first deep red, after a few months (when they may be half an inch in diameter) they turn brown. The portion of the twig beyond the gall is generally killed, and when the fungus is abundantly present a significant amount of damage may be caused by the death of the twigs.

A fungus agreeing in spore characters with *Pestalozzia funerea* [*R.A.M.*, xiii, p. 598] was isolated from dead or dying branches of cedar and various conifers, but its pathogenic capability is not known. Another fungus, apparently a *Phomopsis*, is stated to be very common in Bermuda on the dead scales clothing the larger twigs of cedar.

BOERNER (F.). **Hexenbesen an Cedrus atlantica.** [Witches' brooms on *Cedrus atlantica.*]—*Mitt. dtsch. dendrol. Ges.*, xlvii (*Jb.*), p. 243, 1 fig., 1935.

Attention is drawn to the occurrence on a 7 to 8 m. high *Cedrus atlantica* in the Sanssouci Palace (Potsdam) gardens of a witches' broom, 50 cm. in diameter, of unknown origin. The so-called 'dwarf' varieties, e.g., of *C. libani* var. *nana*, are believed to arise through the use of portions of such excrescences for grafting purposes [cf. *R.A.M.*, xv, p. 68].

REMINGTON (J. S.). **Some notes on wood preservation.**—*Paint Manuf.*, vi, pp. 8–10, 1936. [Abs. in *Chem. Abstr.*, xxx, 5, p. 1594, 1936.]

Following a brief discussion of various types of wood-rotting and their control by preservatives such as creosote, cuprinol [*R.A.M.*, x, p. 733], and synthetic resin varnishes, the writer draws attention to the widespread use as driers of several metallic naphthenates. A priming coat that limits fungal infection consists of 73 kg. 35 per cent. leaded zinc oxide [ibid., xv, p. 40], 9·1 kg. bleached diatomite, 18·9 l. raw linseed oil, and 3·8 to 4·7 l. white spirit containing 3 per cent. copper naphthenate.

LIESE (J.). **Heutiger Stand der Holzkonservierung.** [The present status of wood preservation.]—*Z. angew. Chem.*, xlix, 1, p. 37, 1936.

Impregnation with coal-tar oil is stated to be widely used in Germany [*R.A.M.*, xv, p. 187] for railway sleepers, and in this connexion attention is drawn to the difficulty of reaching the heartwood in certain kinds of timber, e.g., pine, and to some recent technical improvements designed to overcome this resistance. In the kyanization process [ibid., xiii, p. 667], the layer of protective material deposited on the wood is only 2 to 5 mm. in thickness. The outcome of a three months' experiment in the fungal infection of wood so treated showed that, whereas the outer ring was practically sound, the inner ones as far as the heart had lost 25 to 50 per cent. of their initial weight. The protective action of this treatment, however, must not be underrated, the fibres becoming permeated with the mercuric chloride in such a way as to preclude leaching-out. The different woods vary in their capacity for adsorption of mercuric chloride, pine, for instance, taking up 122 per cent. of the solution (based on initial weight), while the corresponding figure for dried spruce is only 27 per cent. The replacement of mercuric chloride by the indigenous sodium fluoride is attended by certain disadvantages,

notably insufficient fixation by the wood and instability which may be remedied, however, by the addition of arsenic compounds and bichromates (the so-called 'U' salts) [ibid., xv, p. 333]. A prerequisite condition of impregnation by osmosis [loc. cit.] in the true sense is a semi-permeable membrane, which is not present in the dead cell walls of wood. There can thus be no question of osmosis, properly speaking, but merely of differences in the rate of diffusion of the salt molecules through the material. A definite conclusion as to the value of this method of treatment cannot be reached at present, whereas the efficacy of the 'U' salts is beyond dispute. It is important that freshly felled wood should be treated immediately after decortication, and that, particularly in the case of pine, the solution should penetrate to an adequate depth, preferably under pressure.

RIEMAN (E. H.). **Improved chemical wood preservation from use of chromated zinc chloride.**—*Agric. News Lett.*, iv, 1, pp. 2–5, 1936. [Mimeographed.]

From statistical data compiled during the past seven years it is computed that some 93 per cent. of the 184,000,000 cu. ft. 'salt'-treated timber in the United States was subjected to impregnation with zinc chloride. In this connexion attention is drawn to the recent development by the Grasselli Chemical Company, Cleveland, Ohio, in collaboration with the wood-preserving industry, of a superior, non-proprietary reagent known as Grasselli chromated zinc chloride. This product, which consists of a high-grade commercial zinc chloride and sodium dichromate of approved quality in appropriate combinations, is stated to compare favourably with heavy retentions of creosote oil [*R.A.M.*, xiv, p. 269] in preservative value, while its physical permanence and maintenance of toxicity under outdoor conditions have been fully substantiated. Chromated zinc chloride can be used in any plant equipped for the 'vacuum-pressure' impregnation process, and has the further advantage of freedom from all toxic volatile organic chemicals so that it may safely be employed for domestic purposes.

HÄGER (B.). **A new method for impregnation of wood.**—*Trävaruind.*, xx, pp. 281–284, 1935. [Abs. in *Chem. Abstr.*, xxx, 1, p. 262, 1936.]

Logs in Scandinavia are treated for some hours with a solution of sodium arsenate at 92° to 94° C. to remove the air and water within them, after which the solution is cooled to between 75° and 80° and left for twelve hours. During this period partial penetration of the wood takes place. The warm solution is then pumped off and replaced by a cold solution of zinc chloride, which is left for twelve hours. This mixture also penetrates the wood and reacts with the sodium arsenate to form zinc arsenate, insoluble in water. In this form the arsenic is toxic to all wood-destroying organisms [cf. *R.A.M.*, xv, p. 333] but not to man.

GUILBERT (F.). **Maladie du cœur de la Betterave.** [Heart rot of the Beetroot.]—*Bull. Ass. Chim. Sucr.*, liii, 1, pp. 23–30, 1 diag., 1936. [English and German summaries.]

In a case of heart rot of beets studied in 1934 in Seine-et-Marne [*R.A.M.*, xv, pp. 273, 337] the soil was found to contain a superabundance of lime (P_H 9). Seed-clusters infected by the pycnidia of *Phoma*

betae [ibid., xv, p. 337] did not necessarily develop the disease, but there is considered to be no doubt that the fungus aids in its establishment in soils of a favourable reaction. It is recommended that boron and humiferous manures be incorporated with the soil in quantities calculated to adjust the hydrogen ion concentration to P_H 7 [see next abstracts].

Crown rot in Sugar Beet.—*J. Dep. Agric. Irish Free St.*, xxxiii, 2, pp. 207–210, 1935.

In preliminary tests carried out at eleven centres in four counties in the Irish Free State, plots on which sugar beets had previously been attacked by crown rot were dressed (in addition to the usual manuring) with 10, 20, and 30 lb. per acre, respectively, of finely powdered borax [*R.A.M.*, xiv, p. 551], a further plot remaining untreated as a control. The application was made about the time the crop was sown or a few weeks afterwards. At four further centres where the disease had already appeared during the current season, 30 lb. of borax per acre was applied during mid-August.

The average returns from eight centres on which the disease developed showed that whereas the plots which received no borax yielded 6 tons 8 cwt. of roots per acre with a sugar-content of 16·2 per cent., the corresponding figures for those receiving 10, 20, and 30 lb. of borax per acre were, respectively, 9 tons 7 cwt. and 16·8 per cent.; 10 tons 17 cwt. and 17·7 per cent.; and 11 tons 5 cwt. and 17·8 per cent. In three centres where no crown rot developed none of the borax applications depressed either the yield or the sugar content. The average returns from the four centres where the disease had already appeared when the borax was applied showed that the 30 lb. applications increased the sucrose yield per acre by 70 per cent. While the P_H value of the soil at one centre was not ascertained, in four it was 5·8, 5·8, 7·85, and 7·7, respectively, and in all the others over 8. As a result of these tests, the application of borax at the rate of 20 lb. per acre is recommended as a preventive of crown rot on alkaline soils in affected districts [see preceding and next abstracts].

Boron and plant life.—*Fertil. Feed. St. J.*, xx, 25, pp. 720–724; 26, pp. 748–751, 1935; xxi, 1, pp. 4–6, 8; 3, pp. 60–64, 28 figs., 1 graph, 1 map, 1936.

Following an introductory account of the importance of boron in plant life, with bibliographical references, some outstanding recent work on diseases in which the absence of this element is involved is reviewed and discussed. The following items in the paper are of interest. According to R. Dietz (*Landeskultur*, ii, p. 161, 1935), the reclamation disease [*R.A.M.*, xv, p. 355] affecting barley, clover, potatoes, and turnips in Austria is due to the presence in the soil of iron in the ferrous state, a condition remediable by the application of boron, which oxidizes the harmful ferrous into the beneficial ferric iron. In a test on turnips suffering from heart and dry rot (regarded as a sequel to reclamation disease) the addition to the complete fertilizer of boric acid at the rate of 36 lb. per acre increased the yield (compared with that of the complete fertilizer plot) in two plots receiving this constituent by 70·4 and 67·5 per cent.

Prof. Oswald and his collaborators from the Swedish Agricultural Institute found that sugar beets are affected by heart rot [ibid., xv, p. 338] on 44 per cent. of the farms in the Karpalund district, where the estimated crop reduction from this cause is 12 per cent., involving a loss to the farmers of Kr. 60 (£3 2*s.*) per acre. In experiments on a farm where the disease was prevalent, the addition to the fertilizer of borax at the rate of 18 lb. per acre increased the beet yield from 9 tons 4 cwt. to 12 tons 4 cwt. per acre, the sugar content from 15·4 to 17·6 per cent., and the sugar yield from 1 ton 8 cwt. to 2 tons 3 cwt. Even on a farm where no symptoms of heart rot were present the addition of borax at the rate of 7 lb. 4 oz. per acre raised the beet yield by over 1 ton per acre. Generally speaking, the element should be applied at the rate of 9 lb. per acre on soils without heart rot and at 18 lb. where the disease is prevalent [see preceding abstracts].

In Denmark the attacks of heart and dry rot on beets were more severe in Lolland-Falster in 1935 than at any time during the last 17 years. At Hornum good results were obtained by the application of borax at the rates of 6¾ or 13½ lb. per acre and at Haarby by the same treatment at 13½ or 27 lb. per acre. The mottling of kohlrabi [ibid., xv, p. 189] commonly present in the Aabenraa district is ascribed by Ravn to boron deficiency.

Brown heart of swedes [ibid., xv, p. 188 and next abstract] was satisfactorily controlled in experiments conducted by E. A. Jamalainen (*Bull. St. agric. Res. Sta.*, Helsinki, Finland, 72, 102 pp., 1935) by the addition to the fertilizer of boric acid at the rate of 4½ or 7·2 lb. (equivalent to 6¾ and 11·1 lb. borax, respectively) per acre.

O'Brien (D. G.) & Dennis (R. W. G.). **Further information relating to control of raan in Swedes.**—Reprinted from *Scot. J. Agric.*, xix, 18 pp., 1 fig., 1 map, 1936.

The results of further experiments in the counties of Kirkcudbright and Dumfries on the control of 'raan' [or brown heart] in swedes [see preceding abstract] showed that the disease (which was incidentally observed also to affect yellow turnips) is completely curable by the application to the soil, just before sowing, of pure borax or terravit at the rate of 20 lb. per acre. Beneficial effects may also be conferred by the same treatment as late as August if the pre-sowing application has been omitted. Liming was found to aggravate the symptoms of boron deficiency, and where heavy applications of lime are essential for the control of club root [*Plasmodiophora brassicae*], a dressing of borax should also be given. Borax may not be mixed with any manure containing ammonia or any other ammonium salt, since the reaction thus set up involves the liberation and escape of the nitrogenous constituent.

Van Riemsdijk (J. F.). **Physiologische onderzoek van de 'vergelingsziekte' van Voederbieten en de schade door deze ziekte teweeggebracht.** [A physiological study of the 'yellowing disease' of Fodder Beets and the damage induced by this malady.]—*Tijdschr. PlZiekt.*, xli, 12, pp. 317–329, 1935. [French summary.]

An examination of beet leaves affected by 'yellowing' in Holland

[*R.A.M.*, xv, p. 191] showed the foliage to be shorter, less pointed, heavier, thicker, and more liable to rust (*Uromyces betae*) than that of healthy plants. The stomata of the diseased leaves open less widely than those of healthy ones. The leaves of yellowed plants exhale more carbon dioxide and contain a higher percentage of sugars (hexose, saccharose, and maltose) than those of sound ones and the absorption and transpiration of water is impeded in the former. The accumulation of starch, therefore, is a direct consequence of the stoppage in the transport of carbohydrates, which in its turn results from gummosis of the phloem [ibid., xiv, p. 210].

The average weights of the roots of 50 diseased and 50 healthy beets were 2,783 and 3,428 kg., respectively, the corresponding figures for leaf weight, dry matter, and sugar content being 0·876 and 0·756 kg., 11·9 and 12·7 per cent., and 6·2 and 7 per cent., respectively. Where half the crop is affected a 10 per cent. loss is experienced. Diseased plants behave like those with cut leaves, forming an abundance of heart leaves which contribute to the exhaustion of the root and retard recovery after transplantation. The striking correlations between beet yellowing and potato leaf roll indicate that a virus is implicated in the etiology of the former.

Van Schreven (D. A.). **De vergelingsziekte bij de Biet en haar oorzaak.** [The yellowing disease of the Beet and its cause.]—*Meded. Inst. Suikerbiet., Bergen-o.-Z.*, 6, pp. 1–36, 7 figs., 1936. [French summary.]

Following an introductory note on the various physiological, fungal, and virus diseases liable to induce foliar chlorosis in the beet in Holland, the writer gives a tabulated account of experiments to determine the origin of 'yellowing', attributed in certain quarters to a physiological disturbance and in others to virus infection [see preceding abstract].

The possible influence of soil moisture on the course of the disease was investigated by (*a*) growing the plants in cement tubs at different ground water levels, (*b*) cultivation in pots with the soil (humus or quartz sand) kept at varying percentages of the water-holding capacity, (*c*) wounding the roots by various methods, and (*d*) growing the plants in the field on ridges or in the channels formed between the ridges. Some of the plants grown in trays under conditions of maximum humidity developed a form of chlorosis differing from any of those hitherto described, but with the onset of a sunny period the foliage resumed its normal colour. A compact habit of growth characterized the roots of plants growing under excessively humid conditions. In the pots in which the soil was maintained at only 5 or 10 per cent. of its water-holding capacity, the plants showed signs of wilting during warm weather and necrosis of the older leaves was accelerated. In dry weather wilting rapidly followed the transverse sectioning of the tap-root at a depth of 15 to 20 cm., and recovery was very slow. Inconclusive results were given by the field experiments in the ridge and channel methods of planting, the disease occurring sporadically in both lots.

In experiments on the transmission of the disease 36 plants remained healthy in cages on a soil in which the disease had often been observed in a virulent form. Positive results were obtained in attempts to transmit

the disease by means of *Aphis fabae* both from seed-bearers and plants in the open field, all the 35 plants inoculated contracting the symptoms. The older the plants the more tardy was the manifestation of yellowing, while in the case of seedlings the older foliage was the first to suffer. A retardation in the translocation of starch was observed in the diseased plants, as well as gummosis of the phloem. The average weights of 296 roots of yellowed and healthy plants were 146 and 191 kg., the corresponding sugar weights being 23·50 and 33·28 kg., respectively. The outcome of these experiments is considered to point to the implication of a virus in the causation of beet yellowing.

SKUDERNA (A. W.), PRICE (C.), CULBERTSON (J. O.), & CORMANY (C. E.). **The curly-top resistant Beet variety.**—*Facts ab. Sug.*, xxxi, 1, p. 17, 1936.

In further extensive trials conducted with the curly top-resistant U.S. No. 1 beet variety [*R.A.M.*, xiv, p. 488] in 1934 in California, Idaho, and Utah, this selection produced on an average 13·35 tons of beets per acre compared with 5·47 for the ordinary commercial strains. In 11 test plantings in representative areas, the resistant variety produced 7·04 tons more beets, 0·30 per cent. higher sucrose, and 2,625 lb. more sugar per acre than the commercial brands used for comparison. Some 30,000 acres are stated to have been planted with U.S. No. 1 in 1934 and between 70,000 and 80,000 in 1935.

SCOTT (G. T.). **New curly-top resistant strains of Beets.**—*West. Irrig.* [*San Francisco*], xviii, 2, p. 7, 1936. [Abs. in *Facts ab. Sug.*, xxxi, 4, p. 151, 1936.]

The U.S. Nos. 33 and 34 sugar beet strains, derived by selection from the curly top-resistant U.S. No. 1 [see preceding abstract], are stated to show marked individual differences, the former being primarily of interest as a sugar-producer while the latter represents the yield type, being more vigorous and resistant. During the past season the average yields of U.S. Nos. 1, 33, and 34 in eight tests [? in California] under conditions involving severe exposure to curly top were 12·7, 15·6, and 17·9 tons per acre, the corresponding figures for sugar production being 17·6, 17·9, and 17·9 per cent., respectively.

PIERCE (W. H.). **The identification of certain viruses affecting leguminous plants.**—*J. agric. Res.*, li, 11, pp. 1017–1039, 7 figs., 1935.

Following a brief reference to the confusion now existing in the classification of mosaic diseases affecting leguminous plants [*R.A.M.*, xv, p. 274] the author gives a fairly full account of his studies, for purposes of differentiation and identification, of the viruses obtained from various leguminous hosts, which are described and classified by him under the designations common bean (*Phaseolus vulgaris*) mosaic (bean virus 1) [ibid., xv, p. 341], yellow bean mosaic (bean virus 2), white clover mosaic (white clover virus 1), enation pea mosaic (pea virus 1) [ibid., xiv, p. 486] (also described by M. W. Stubbs in an unpublished thesis, University of Wisconsin, 1935), common pea mosaic (pea virus 3), soy-bean mosaic (soy-bean virus 1) [*R.A.M.*, iii, p. 626], and a virus obtained from red clover (*Trifolium pratense*) producing local

necrotic lesions on the small-seeded broad bean (*Vicia faba* var. *minor*). Although admittedly preliminary, the results indicated from a practical standpoint that the most significant differences between the viruses are to be found in their host ranges and in the varietal susceptibility to them of peas and beans. The pea viruses 1 and 3 were shown not to be transmissible to beans by any of the methods tried, and were differentiated from each other on the basis of the varietal reaction to them of peas and upon differences in their host range, as well as by the fact that the first was infective to soy-bean but not the second. Bean viruses 1 and 2 are readily distinguished from each other by means of differential bean varieties, and the second was transmissible to certain varieties of peas. White clover virus 1 is characterized by its ability to infect all the varieties of beans and peas that were tested, as well as by the symptoms caused by it. The broad bean local lesion virus differed from all the other viruses in producing local necrotic lesions at the points of inoculation on the broad bean, and the soy-bean virus appeared to be specific to soy-bean, all the other host species being apparently immune from it. Slight differences were further noted in some physical properties of the various viruses, such as thermal death point and longevity *in vitro*. The thermal death point of bean virus 2 was determined as 58° to 60° C., of white clover virus 1 as 58°, pea virus 1 as 58°, pea virus 3 as 62° to 64°, and broad bean local lesion virus as 60° to 62°, the longevity of the viruses *in vitro* being 1 to 2 days, 6 to 7 days, 2 to 3 days, 2 to 3 days, and 2 to 3 days, respectively.

BÖNING (K.). **Versuche zur Bekämpfung der Fettfleckenkrankheit der Bohnen.** [Experiments on the control of the grease spot disease of Beans.]—*Prakt. Bl. Pflanzenb.*, xiii, 9–10, pp. 252–260, 1936.

Encouraging results were obtained in 1934 and 1935 at the Bavarian Plant Breeding and Plant Protection Institute, Munich, in experiments on the control of grease spot of beans [*Phaseolus vulgaris*], caused by *Pseudomonas* [*Bacterium*] *medicaginis* var. *phaseolicola* [*R.A.M.*, xv, pp. 4, 191] by various methods of seed disinfection and treatment of the growing plants, the total yield of the treated plots exceeding that of the controls by more than two-thirds in the former and one-fifth in the latter year, while some four-fifths more healthy beans were obtained from the disinfected than from the untreated plots in both years. The variety used was the highly susceptible Harz Flageolet to which three treatments of 1 or 2 per cent. Bordeaux mixture or Wacker's and cusisa [ibid., xv, pp. 1, 324] dusts were applied in 1934 and two in 1935. In practice one timely application would probably suffice to control the disease. Seed disinfection with 0·125 per cent. ceresan (30 minutes' immersion), ceresan dust (0·5 gm. per kg.), and hot water (30 minutes at 45° C. or 10 at 50° [ibid., xi, p. 687] was only partially successful, the last-named being the most effective and reducing the incidence of infection from $79{\cdot}1 \pm 13{\cdot}7$ to $34{\cdot}2 \pm 7{\cdot}5$ per cent.

The results of varietal reaction tests largely confirmed those obtained by Stapp [ibid., xiv, p. 415] in respect of the great susceptibility of several Flageolet types (Red Paris, St. Andreas, Wachs Red), Metis, Incomparable, Wachs Mont d'Or, and Wachs Dattel. All the Saxa forms proved resistant, as also did Konserva, Unerschöpfliche [Inex-

haustible], several types of Hinrichs Riesen, Wachs Ideal, and Wachs Neger. The results with Karlsruhe Market, Kaiser Wilhelm, and Nordstern were conflicting and point, with other indications, to the possible existence within the pathogen of physiologic forms.

The outcome of experiments in the use of various combinations of fertilizers was of purely theoretical interest, the differences in the response of the plants being very slight, though in 1934 potash deficiency and an excess of nitrogen and phosphoric acid appeared to promote infection.

NOLL (J.) & SCHANDER (H.). **Beobachtungen über Schädigungen an Salat, insbesondere die Salatfäule, und Versuche zu ihrer Bekämpfung durch Bodendämpfung.** [Observations on injuries to Lettuce, especially Lettuce rot, and experiments on its control by soil steaming.]—*Obst- u. Gemüseb.*, lxxxii, 1, pp. 5–6, 5 figs., 1936.

In 1934, when late May frosts were followed by a protracted spell of heat and drought, the lettuce crops in the Zittau district of Saxony suffered severely from diseases, of which the most important was the rot caused by *Sclerotinia* (?) *minor* [*R.A.M.*, xii, p. 485; xiii, p. 241]. The fungus involves the sudden drooping and collapse of practically mature plants, the root collar and basal leaves of which are covered with a white mycelium which passes from plant to plant along the ground. Sclerotia are produced on the root collar. The treatment of the plants with quinosol [ibid., xiv, p. 641] was not ineffectual but had to be abandoned as uneconomic, while ceresan and potassium iodide gave unsatisfactory results. Excellent control was given, however, by steam sterilization of the soil (details of the process being reserved for future publication).

BAUDYŠ (E.). **Plíseň Lociková čili Salátová.** [Lettuce or salad mould.]—*Leták fytopath. sekce zemsk. výzk. Ust. zeměd.* [*Leafl. phytopath. Sect. reg. agric. Exp. Sta.*], 93, Brno, 2 pp., 1935.

A brief popular account is given of the morphology and biology of downy mildew of lettuce (*Bremia lactucae*) [*R.A.M.*, xiv, p. 683] which is stated to cause very considerable damage to the crop under glass in Czecho-Slovakia, as well as to certain other vegetables, such as globe artichoke [*Cynara scolymus*], chicory [*Cichorium intybus*], endive [*C. endivia*], and some ornamental plants of the Compositae (including cineraria) and weeds. For the control of the disease are recommended disinfection of the seed-bed with formalin or germisan, the application of potassium fertilizers and quicklime, and the removal of the infected lower leaves.

BÖNING (K.). **Düngungsmassnahmen zur Bekämpfung des Schwarzwerdens der Rettiche.** [Manuring methods for the control of Radish blackening.]—*Prakt. Bl. Pflanzenb.*, xiii, 9–10, pp. 252–260, 1936.

The results [which are fully tabulated and discussed] of experiments (in progress since 1932) at the Bavarian Plant Breeding and Plant Protection Institute, Munich, on the influence of manuring on black root of radishes [*Aphanomyces raphani*: *R.A.M.*, xii, p. 350] indicate the feasibility of control by the extended use of mineral fertilizers,

especially potash and nitrogen salts, in preference to stable manure, and tri- to quadrennial crop rotation. In one series of experiments in frames, treatment of infected soil with calcium cyanamide, ammonium sulphate (each at the rate of 120 gm. per sq. m.) and formalin (10 l. of 2 per cent. solution per sq. m.) completely controlled the disease, whereas the untreated soil gave 39 per cent. infection, and treatment with urea (50 gm.), quicklime (300 gm.), ceresan (10 l. of 0·25 per cent. and 0·5 per cent.), and Bordeaux mixture (1·5 l. of 2 per cent.), 3, 31, 28, 36, and 19 per cent., respectively. Both calcium cyanamide and formalin, however, checked the growth of the plants.

DOUNINE (M. S.), ZAYANTCHKOVSKAYA (Mme M. S.), & SOBOLEVA (Mme V. P.). Болезни Топинамбура и меры борьбы с ними. [Diseases of the Jerusalem Artichoke and their control.]—*Тр. Всесоюзн. Науч.-Исслед. Инст. Зернобоб. Культур* [*Bull. Pan-Sov. sci. Res. Inst. for Leguminous Crops*], Moscow, vi, 1, pp. 7–13, 16–150, 46 figs., 1 diag., 1935. [English summary.]

In this general account of the diseases of the Jerusalem artichoke (*Helianthus tuberosus*) the authors state that white rot of the underground and aerial organs caused by *Sclerotinia sclerotiorum* [*R.A.M.*, viii, p. 155; xii, p. 571] is one of the major diseases of the crop in the central and northern provinces of the U.S.S.R., but much less important in the south. The morphology and biology of the fungus are dealt with in detail, and the fact was again confirmed that the ascospores play an important part in its dissemination. The temperature relations of *S. sclerotiorum* for growth were determined as follows: minimum near 0° C., optimum between 17° and 25°, and maximum between 32° and 34°. The optimum P_H value was 3·5 to 4·0, and the extremes P_H 2·3 and P_H 7·5. It was found that the disease is most severe in heavy, acid clay soils inclined towards swampiness, and could be minimized by draining and liming the soil.

Details are given of an important dying-off of the leaves and die-back of the shoots of the Jerusalem artichoke which was observed for the first time in the Moscow region in 1932. No pathogenic organisms were found in the tissues of affected plants, and the balance of evidence indicated that the trouble is of a physiological nature; it occurred chiefly on clay and sandy loam soils with excessive moisture, and the leaves of the diseased plants showed deficiency in phosphoric acid.

Brief descriptions are also given of the following diseases, which are also found in the U.S.S.R.: *Bacillus phytophthorus* [cf. ibid., xiii, p. 100]; *B. solanisaprus* [cf. ibid., x, p. 125]; *B. aroideae* [ibid., xv, p. 346]; an interveinal necrosis and a spotted chlorosis of the leaves, and a dot-like necrosis of the leaves due to an undetermined bacterium (these three diseases were of no economic importance); a blister-like puckering of the leaves, as well as curliness of the apical leaves, both due to viruses; and storage rots of the tubers, namely, the most important grey rot caused by *Botrytis cinerea*, and the soft rot due to *Rhizopus nigricans*.

The sunflower rust (*Puccinia helianthi*) [ibid., xv, p. 202] is known to attack the artichoke in the United States, but so far no biological race of this rust has been found capable of infecting this host in U.S.S.R., even when growing in close proximity to severely infected sunflowers,

though in one experiment Jerusalem artichoke plants raised from tubers that had been subjected to the action of X-rays were successfully and heavily infected with the rust. Careful searches for *Phymatotrichum omnivorum* [ibid., xi, p. 42] and *Sclerotium rolfsii* failed to reveal the presence of these fungi on Russian territory, and it is recommended that attempts be made to exclude these three diseases from the country by quarantine [ibid., xv, p. 400].

A complete list is given of all the bacteria (five) and fungi (32) recorded on this host. Control measures against all the diseases are discussed at length, and the bibliography at the end of the paper comprises 152 titles.

WAGER (V. A.). **Control of downy mildew in Cucumbers.**—Reprinted from *Fmg S. Afr.* [x], 3 pp., 5 figs., 1935.

Details are given of an experiment conducted at the sub-tropical Research Station, Nelspruit in 1934 on the control of cucumber downy mildew (*Pseudoperonospora cubensis*) [*R.A.M.*, xv, p. 197] which occurs almost invariably in the eastern Transvaal during the summer and early autumn when there are occasional rain storms and heavy night dews, entire plantations often being destroyed by the disease. Three cucumber plots were sprayed with Bordeaux mixture, three dusted with copper-lime, and six left untreated, each plot being $\frac{1}{24}$ acre in area. The seed was planted on 12th March and treatment began as soon as the plants appeared above the ground, the applications being repeated every ten days thereafter. The total yields of the sprayed and dusted plots were, respectively, 592 and 725 lb., the corresponding figures for the controls being 269 and 306 lb. The total cost of the treatment (including native labour) was 11*s.* 0*d.* and the value of the increase in yield £4 12*s.* 9*d.*, this being a net gain of over £4 for the $\frac{1}{4}$ acre treated. It is recommended that under local conditions cucumbers should be thoroughly dusted with copper-lime or Bordeaux dust immediately after rain storms and at least once a week thereafter.

KOCHMAN (J.). **Mączniak rzekomy Rabarbaru Peronospora jaapiana P. Magnus.** [Downy mildew of Rhubarb—*Peronospora jaapiana* P. Magnus.]—*Roczn. Nauk ogrod.*, ii, pp. 159–162, 1935. [English summary.]

The author states that downy mildew of rhubarb (*Peronospora jaapiana*) [*R.A.M.*, xiii, p. 762] was first recorded from Poland in Puławy in 1933, and in 1935 it appeared in epidemic form on rhubarb seedlings grown in cold frames in the neighbourhood of Warsaw. A brief morphological account of the fungus is given. Experiments on the control of the disease by spraying the plants with 1 per cent. Bordeaux mixture gave good results.

BENEMERITO (A. N.). **Mushroom culture in Canton.**—*Philipp. Agric.*, xxiv, 8, pp. 624–634, 5 figs., 1936.

A descriptive account is given of the cultivation in Canton, chiefly in the lowlands, of *Volvaria esculenta* [*R.A.M.*, xiii, p. 420], a species of mushroom widely distributed in the Philippine Islands. In Canton, the growing season lasts from March to September, the heaviest yields

being obtained in June and July, when the prevailing temperature is high; during winter the spawn is kept well protected from the cold. The beds, which are raised about 6 in. above the ground, are usually 20 to 25 ft. long by $2\frac{1}{2}$ ft. wide, and there is a path 2 ft. wide between them. At one end of a row of beds a ditch about 2 ft. wide by 1 ft. deep is dug and the water allowed to flow into it in order to facilitate watering. As many as six layers of rice straw, each 3 in. or more thick and alternating with spawn, are laid down, the straw being trodden down by one man while another pours water over it. Finally, a cover of bundles of straw is placed on top and the whole copiously watered. After a week or so the bundles are removed, soaked in water, and untied, the straw being spread smoothly over the top of the bed, which is then sprinkled with water. After spawning, practically no further attention is given except to water the beds once a day when there is no rain.

Three crops are harvested during the season, each crop requiring 60 to 70 days to mature, though the first mushrooms may be gathered 16 to 20 days after spawning.

DASTUR (J. F.). **Gram wilts in the Central Provinces.**—*Agric. Live-Stk India*, v, 4, pp. 615–627, 4 pl., 4 diags., 1935.

The author states that in the Central Provinces of India the most important diseases of gram (*Cicer arietinum*) are two different wilts, one of which is associated with a species of *Rhizoctonia* resembling *R. bataticola* [*Macrophomina phaseoli*: cf. *R.A.M.*, xv, p. 148], while the other has been shown by field experiments to be physiological in nature. Although the former attacks a wide range of gram varieties, only mature plants are affected and it causes less damage to the crop than the latter. Its first symptom is the bronzing of the leaves on one or more of the lower branches, the colour later changing to yellow and then to brown; the affected branches and leaf stalks are stiff and turned upwards, and the leaflets stand more or less vertically and are prematurely shed; the terminal parts of the tap-root and of the laterals are black or brown and shrivelled. The physiological wilt, on the other hand, is restricted only to certain gram varieties and may appear on the plants at any stage of their growth. The first symptom is the drooping of the tender apical parts with a slight loss of colour of the affected organs; later the plant exhibits distinct chlorosis, and its apical parts and leaves hang down limply. The latter are not easily shed, and with time the wilted plant may turn brown and continue to stand thus in the field for a long time. The root system does not show external signs of rot. In a large number of cases a species of *Fusarium* [ibid., xiii, p. 683] was isolated from the underground roots of a wilting plant, but all attempts to infect seedlings or plants with it through wounds or otherwise invariably gave negative results.

Fairly full details are given of varietal tests of gram which were carried out from 1927 to 1933, inclusive, in a field known to produce plants affected by physiological wilt at Pusa. Nagpur 28 selection gave a high yield but was most susceptible to wilt; a strain from Cawnpore proved very resistant but the yield was poor, while one from Karachi possessed considerable resistance and compared favourably with No. 28

in yield. The results showed clearly that in one part of the field the growth of certain varieties of gram was adversely affected, whereas in the other part these varieties may be safely grown. There was also evidence that the normal cultivation operations do not serve to disseminate the disease, indicating the non-infectious nature of the wilt.

The *Rhizoctonia*-wilted plants did not bear sclerotia, but these were found in pure cultures of the fungus; the sclerotia obtained from the strain isolated from plants of the Karachi variety of gram were much larger in size than those obtained from the strain isolated from the Cawnpore variety, and also differed from the latter in shape; the two strains of the fungus showed differences in growth on artificial media. Both strains failed to infect either wounded or unwounded gram plants in ordinary inoculation experiments, but produced distinct signs of infection when the experimental plants in pots were exposed to high temperatures (75° to 80° C.) for a few hours in the day for six or seven days.

Salmon (E. S.) & Ware (W. M.). **Department of Mycology.**—*J. S.-E. agric. Coll. Wye*, xxxvii, pp. 15–28, 1936.

Among many items of interest in this report the following may be mentioned:

Cladosporium fulvum [*R.A.M.*, xv, p. 407] was found on the cotyledons of recently potted tomatoes at Wye and the evidence indicated that the soil was the source of infection.

Pleospora pomorum [ibid., iv, pp. 226, 227, 421; v, p. 308] was obtained in culture from Bramley's Seedling and Cox's Orange Pippin apples rotting in storage. The fungus was also collected in April on overwintered apple leaves on which it had also been commonly observed in previous seasons.

The new virus disease of Fuggles hops recently reported [ibid., xiv, p. 423] was again noted. When the bines of the affected hills were just past the bar-string the dead or dying tips could be seen hanging away from the strings. The lower leaves of the bine were curled down and had very brittle petioles while leaves of the laterals showed a mosaic mottling. These symptoms are indistinguishable from those of mosaic as seen on Goldings and the Golding varieties but the disease appears late in the season and permits greater growth of the bine, while grafting experiments have shown that Fuggles hops can carry this virus (but not the mosaic virus) without manifesting any symptoms.

On 1st July Cobb's and Canterbury Golding hops from Selling showed a condition possibly due to a virus, and on 11th July a more serious outbreak was discovered at Teynbarn, where 10 to 20 per cent. of the hills in one 3-acre garden of Eastwell Goldings were found to be affected. Growth was checked and numerous long laterals developed from the bine from the breast wire to the bar-string. A yellowish or pale green blotching of the leaves of the main bine was often present. At the tip of the bine the stem was stiff and disinclined to climb, the internodes were short, the stipules were of normal size or elongated, but the leaves were small. These characters give a fluffy or feathery appearance to the tips, and the condition is accordingly designated 'fluffy tip'. The

cones appear to develop normally, but the arrested growth of the main bine and laterals very materially reduces yield.

Fuggles hops in one Kentish garden were slightly infected by *Sclerotinia sclerotiorum* [ibid., xiv, p. 792].

VOELKEL [H.] & KLEMM [M.]. **Die wichtigsten starken Schäden an Kulturpflanzen im Jahre 1935. (Beobachtungs-und Meldedienst der Biologischen Reichsanstalt.)** [The outstanding severe injuries of cultivated crops in the year 1935. (Observation and warning service of the Biological Institute.)]—*NachrBl. dtsch. PflSchDienst*, xvi, 1, pp. 5–10; 2, pp. 17–22; 3, pp. 27–34, 4 graphs, 39 maps, 1936.

Following a summary of the meteorological conditions prevailing in Germany during 1935 the writers give notes on the damage inflicted on cereals, potatoes, beets, fodders and meadow grasses, vegetables and miscellaneous commercial crops, and fruit by some well-known diseases and pests (the distribution of which is shown by maps) during that year [cf. *R.A.M.*, xiv, p. 424].

POLE EVANS (I. B.). **Pasture research and crop production. Annual report of the Division of Plant Industry.**—*Fmg S. Afr.*, x, 117, pp. 548–560, 2 figs., 1 map, 1935.

The following items of phytopathological interest, besides those already noticed from other sources, occur in this report [cf. *R.A.M.*, xiv, p. 426]. With the advent of flue-curing, tobacco mildew [*Erysiphe cichoracearum*: ibid., xiv, pp. 60, 533] has assumed some economic importance, since the most inconspicuous lesions are the cause of unsightly blemishes on the cured leaf. Leaf curl of tobacco [ibid., xiv, p. 678; xv, p. 118], like 'kromnek' [ibid., xiii, p. 401] (probably identical with spotted wilt) [ibid., xv, p. 324], is a disorder of erratic distribution. During the past season it was of rare occurrence in the eastern and western Transvaal but caused up to 100 per cent. loss in large plantings in the north. The whitefly vector [*Bemisia* sp.] overwinters on stump suckers and the disease is therefore largely controllable by destroying old stumps after harvesting.

No citrus canker [*Pseudomonas citri*] has been detected in the Union during the past seven years, and permission was granted in 1935 to plant in the quarantined area 9,740 trees and 91,700 seeds, and to bud 8,940. Five cases of scaly bark or psorosis [ibid., xiv, p. 426] were observed among the 7,310 trees inspected in the Cape Province and 330 out of 461,443 in the Transvaal.

Red locusts [*Nomadacris septemfasciata*] kept in captivity and inoculated with a species of *Beauveria* died after six to ten days [ibid., xii, p. 217], but field experiments were unsuccessful, and it is concluded that the fungus is only able to attack individuals weakened by adverse environmental factors.

An extreme type of mouldy core, caused by a species of *Penicillium*, was found in apples suffering from a form of internal breakdown [ibid., xv, pp. 299–302]. *Phoma* [*Mycosphaerella pomi*: ibid., xiv, p. 151] was reported to have caused 50 per cent. infection on apples still on the tree in one locality in the eastern Cape Province. Other records include

powdery mildew (*Oidium* sp.) of broad beans [*Vicia faba*] and *Macrosporium* leaf spot of chrysanthemum, groundnut, and watermelon.

HANSFORD (C. G.). **Annual Report of Mycologist, 1934.**—*Rep. Dep. Agric. Uganda for the year ended 31st December, 1934* (Part II), pp. 73–88, 1 graph, 1936.

Further investigations carried out in Uganda into blast (*Piricularia* sp.) of *Eleusine coracana* [*R.A.M.*, xiv, p. 81] showed that in culture the fungus was indistinguishable from one found on *Digitaria*. Inoculations made on unwounded *E. coracana* plants with both organisms gave only a very few positive results, indicating that special conditions are required for infection. Native seed supplies may carry the fungus on the surface and in the tissues; in the latter case the seedlings rarely survive more than a few days.

Two strains of *Helminthosporium* provisionally identified as *H. leucostylum* and *H. nodulosum* [ibid., xiv, p. 440] were isolated from *E. coracana*. The former often causes a seedling blight on this host, the plants withering and dying as a result of severe attack. Infection of the heads may result in a varying amount of partially filled grain, the affected ears usually showing a dark conidial growth. *H. nodulosum* caused a stem blight and foot rot of *E. coracana*. Infected plants develop a dark basal rot and dark areas on the culms and spots about 10 by 1 mm. in diameter. When basal infection occurs early in the season growth is retarded, and the plants often dry out completely before harvest, producing little or no crop.

Three types of groundnut (*Arachis hypogaea*) rosette [ibid., xiv, p. 739; xv, p. 277] are found in Uganda, viz., (1) typical 'rosette' with condensation of the stems and branches, (2) 'mottling' of the leaves, without marked yellowing or typical 'rosette' symptoms, and (3) 'yellows', a pronounced mosaic, the lighter areas varying from bright yellow to nearly white, no 'rosette' symptoms being present. The diseases distinguished as 'rosette' and 'yellows' have most effect on yield.

Cotton blackarm (*Bacterium malvacearum*) [ibid., xiv, pp. 97, 358], owing to alternating wet and dry periods during the 1934–5 season, attacked the plants with greater effect than usual. Much evidence is accumulating that blackarm is becoming increasingly important in some areas west of the Nile. Seed dusting with abavit B and abavit new very considerably reduced infection but gave no significant increase in yield. Wilt (? *Fusarium vasinfectum*) [ibid., xiv, p. 82; xv, pp. 149, 366] is increasing in parts of Buganda Province round Lake Victoria; west of the Nile it is common in the Mengo district and worst in Masaka, where plots showed over 20 per cent. infection. Some evidence was obtained that the disease is seed borne and can spread in infected debris from a previous crop. Many cotton plants affected with an *Alternaria* leaf spot [cf. ibid., xiv, pp. 629, 755] showed root infection by *Rhizoctonia bataticola* [*Macrophomina phaseoli*: see above, p. 423], a large proportion dying.

Cassava mosaic [ibid., xv, p. 277] has become of considerable importance in some parts of Uganda, where this crop forms a major reserve food supply of the natives. In the Teso district nearly 100 per cent.

infection is present on the long season variety, though the short season variety is much more resistant.

Sugar-cane red stripe (*Phytomonas rubrilineans*) [ibid., xv, p. 320] was heaviest on P.O.J. 2727, but also occurred on P.O.J. 2878, 2725, Uba, and other varieties. On one estate almost complete control resulted from roguing out affected canes with those attacked by mosaic. At present the predominating cane in Uganda is P.O.J. 2725, which is practically immune from mosaic and is more resistant to red stripe than other varieties.

EDSON (H. A.), MILLER (P. R.), & WOOD (JESSIE I.). **Diseases of plants in the United States in 1934.**—*Plant Dis. Reptr, Suppl.* 90, 135 pp., 12 graphs, 8 maps, 1935.

This report, prepared on the usual lines [*R.A.M.*, xiv, p. 348], contains an abundance of valuable information on the diseases of cereal, forage and cover, fruit and nut, vegetable, special, and sugar crops, trees, and ornamental plants in the United States during 1934.

PELUFFO (A. T.). **Uruguay: pests and diseases of plants.**—*Int. Bull. Pl. Prot.*, x, 2, pp. 29–30, 1936.

During 1934 *Plasmopara viticola* caused exceptionally heavy damage in Uruguayan vineyards, attacking not only the vines but the fruits; experiments in the control of the disease by a combination of Bordeaux mixture and ammonium chloride gave promising results. The same host was attacked by *Gloeosporium ampelophagum* [*Elsinoe ampelina*: *R.A.M.*, xv, p. 362]. Fruit trees suffered serious injury from gummosis [cf. ibid., xii, p. 575 *et passim*]. Pears were infected by *Venturia pirina*, quinces by *Stigmatea mespili*, and peaches by *Exoascus* [*Taphrina*] *deformans*. The most important wheat disease was loose smut (*Ustilago tritici*), infecting up to 30 per cent. of the crop.

MALLAMAIRE (A.). **French West Africa: cryptogamic diseases and phanerogamic parasites observed in Guinea.**—*Int. Bull. Pl. Prot.*, x, 2, pp. 25–26, 1936.

A list is given of some well-known fungous diseases affecting industrial trees and shrubs, fruit, cereals, and leguminous cover crops in French Guinea [cf. *R.A.M.*, xv, p. 79]. *Mycosphaerella manihotis* [ibid., xii, pp. 137, 552] is recorded as a parasite of cassava.

WALLACE (G. B.). **A root disease of Cacao (associated with Ustulina zonata Lev.).**—*E. Afr. agric. J.*, i, 4, pp. 266–268, 2 figs., 1936.

Cacao and kapok [*Eriodendron anfractuosum*] growing together on a plantation in the Usambara mountains, Tanganyika Territory, have for some years been affected by a disease associated with *Ustulina zonata* [*R.A.M.*, iv, p. 333]. The diseased cacao trees somewhat resemble trees affected by *Armillaria mellea*; the leaves droop, turn yellow and brown, drop off, and are not replaced. The roots, however, show no rhizomorphs or cracking and no mushroom odour is present. Black lines develop in the wood, and a feathery mycelium is abundantly present under the bark and as layers in the bark tissue. The fructifications occur on the bark of the collar and sometimes on exposed roots. It is

thought that the fungus may have been present only as a secondary invader since in the same plantation dead cacao trees were found showing no trace of any parasite. It is recommended that all dead and unthrifty trees should be removed with as much of their roots as possible.

Koehler (B.). **Seed treatments for farm crops.**—*Circ. Ill. agric. Exp. Sta.* 444, 19 pp., 10 figs., 2 diags., 1936.

The information here presented in a popular form on the treatment of cereal seed-grain by chemical disinfectants is stated to be based largely on the recommendations already given in a bulletin of the Illinois Agricultural Experiment Station [*R.A.M.*, xv, p. 346]. Details are given of the construction and application of a small gravity treater consisting of a series of three vertically arranged funnels, with perforated cones between them, the lowest funnel leading into a sack at the base. While one man slowly pours 1 bush. of seed-grain into the topmost funnel, another gradually introduces ½ oz. ceresan immediately above the centre of the funnel. Treatment can be applied much more rapidly (though less thoroughly) by this apparatus than by the ordinary barrel mixer, and furthermore the diffusion of dust is obviated by the close connexion between the spout of the funnel and the sack at its base.

Davydoff (P. G.). Новая комбинированная протравливающая машина Борггардта. [Borghardt's new combined seed treating machine.]—*Pl. Prot. Leningrad, 1935*, 1, pp. 139–143, 5 figs., 1935. [Received May, 1936.]

A brief technical description is given of the construction (on the plans suggested by Prof. Borghardt) and working of a new hand-driven apparatus, adapted for the dust, semi-dry, and liquid disinfection of cereal seed-grain, and in which the admission of the fungicidal dust or liquid is automatically controlled by an easily adjustable contrivance. Its output is claimed to be 771, 504, and 703 kg. oats per working hour for the dry, semi-dry, and liquid treatments, respectively, and 3,229 kg. wheat and 1,700 kg. barley for dusting.

Gordon (W. L.). **Species of Fusarium isolated from field crops in Manitoba.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 298–299, 1935.

A tabulated list is given of 20 species, varieties, and forms of *Fusarium* (representing seven sections of the genus) which were isolated in 1932 from cereal crops in Manitoba, approximately 85 per cent. of the isolations being accounted for by *F. herbarum* var. *avenaceum* (predominant on common and durum wheat, barley, and rye), *F. equiseti* f. 1, *F. oxysporum* var. *aurantiacum*, and *F. culmorum* (more frequent on oats than any other species). These findings indicate that in that year comparatively few species of *Fusarium* were commonly associated with root and foot rots of cereals in Manitoba. [This article, and others from the *Proc. World's Grain Exhib. Conf.* are reprinted, without change of pagination, in *Proc. Canad. phytopath. Soc. 1935*, 3, 1935.]

Greaney (F. J.). **Method of estimating losses from cereal rusts.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 224–238, 10 graphs, 1935.

Details are given of a method which was used during the sulphur-dusting experiments in Manitoba for the prevention of cereal rusts (*Puccinia* spp.) [*R.A.M.*, xiii, pp. 499, 618] to correlate rust infection and the yield of the various plots of standard varieties of wheat and oats attacked by stem [black] rust (*Puccinia graminis*), as well as rust infection and the specific gravity of the grain per measured bushel. The results showed that the relation of regression of yield, and of weight per bush. to percentage stem rust was linear, indicating that uniform increases in rust result in uniform reductions in yield and grain quality. This method allowed of determining percentage-loss values, giving the reduction in yield and in grain quality for each 10 per cent. increase of rust for the standard wheat and oat varieties tested, and these values were then used in calculating, on the basis of acreage, yield, and price statistics, the annual losses due to black rust in Manitoba and Saskatchewan. The resulting estimates indicated that during the eight years from 1925 to 1932 the average annual losses in these two provinces in wheat were 15·5 per cent. of the crops, representing an annual loss of 37,396,000 bush. of wheat (valued at $35,438,000); and 11·1 per cent. in oats (during 1930 to 1932 only), representing 13,525,000 bush., valued at $2,624,000. Even in the so-called 'non-rust' years rust caused quite a substantial loss.

Popp (W.). **A preliminary study of the reactions to stem rust of certain Wheat varieties in different stages of development.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 238–243, 1935.

A summarized account is given of preliminary greenhouse experiments, in which the reactions were tested of the wheat varieties H–44–24, Acme, and Marquis at various stages of their development to stem [black] rust (*Puccinia graminis tritici*) form 21, and also of H–44–24, Hope, H–44–24×Marquis R.L. 450, H–44–24×Marquis R.L. 204, Marquis, Reward, and Quality to form 15 [cf. *R.A.M.*, x, p. 170; xv, p. 348]. In all these varieties the first three leaves to develop proved susceptible to the form used. In H–44–24, Hope, Acme, and H–44–24×Marquis R.L. 450 each new leaf from the fourth onwards, when fully expanded, is more resistant than the preceding, and resistance in these leaves increases with their age; by heading time all the leaves from the fourth are practically immune. In the remaining varieties the leaves, leaf sheaths, and peduncles retain their susceptibility to the rust until they begin to lose their green colour. In H–44–24 portions of the leaf sheaths that become temporarily exposed during growth are susceptible, while the parts generally exposed are highly resistant.

Histological studies showed that in the varieties H–44–24, Acme, Marquis, Reward, and Quality, the proportion of sclerenchymatous to collenchymatous tissue increases in each consecutive leaf from the second to the topmost, and while in H–44–24, Hope, and Acme the sclerenchymatous tissue restricted to some extent the spread of the rust mycelium in the tissues, it is not considered that resistance can be solely attributed to the mechanical obstruction offered by this tissue.

ANDERSON (J. A.). **Studies on the nature of rust resistance in Wheat. VII. Chemical analyses of hybrid lines of Wheat differing in their rust reactions.**—*Canad. J. Res.*, xiv, 1, pp. 1–10, 1936.

In further studies of the nature of the resistance of wheat to black rust [*Puccinia graminis*: *R.A.M.*, xiv, p. 293] chemical analysis was made of the leaves during the seedling stage and after heading of twelve hybrid lines (pure for rust resistance only) from a Marquis × H–44–24 cross which fell into the four classes RR, RS, SR, SS, the first letter indicating the resistance or susceptibility of the seedling and the second that of the mature plant. The four classes of wheat proved to be very similar in composition at each of the two stages of growth and though significant differences occurred between the wheats in many of the fractions, no relationship was found between any fraction and either type of rust reaction. Though only negative results were obtained the investigation is considered to mark the first step in a logical, chemical investigation of the rust problem, preparing the way, as it does, for more detailed studies of the possible relations of individual constituents of the wheat leaf to rust reaction.

JOHNSON (T.) & NEWTON (MARGARET). **Hybridization between Puccinia graminis tritici and Puccinia graminis avenae.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 219–223, 1 pl., 1 graph, 1935.

In continuation of their studies on specialization and hybridization in *Puccinia graminis* [*R.A.M.*, xii, p. 14; xiv, p. 500], the authors give a brief account of a new hybrid form of the rust which they obtained by fertilizing pustules of *P.g. tritici* form 9 on the barberry with nectar from a pustule of *P.g. avenae* form 6. The new form was shown to be pathogenic, although less severely than *P.g. tritici* form 9, to a number of wheat varieties, including Liguleless and Little Club; to the three barley varieties (Success, Manchurian, and O.A.C. 21) tested; and to the four oat varieties Victory, White Russian, Richland, and Joanette Strain (although to a somewhat more limited degree than the *P.g. avenae* form 6), as well as to *Agropyron tenerum* and *Hordeum jubatum*, thus presenting a combination of the pathogenic properties of its two parents. The work, however, gave clear evidence of a low degree of inter-fertility between the *P.g. tritici* and *P.g. avenae* races. So far no crosses of the two have been found in nature.

HANNA (W. F.) & POPP (W.). **Experiments on the control of loose smut of Wheat by seed treatment.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 243–248, 1 graph, 1935.

The results of the small-scale experiments reported in this paper showed that loose smut [*Ustilago tritici*: *R.A.M.*, xiv, p. 745] in Reward wheat was completely controlled by steeping the seed-grain, pre-soaked for four hours, for 10 minutes in hot water at temperatures between 125° and 129° F. without undue injury to the seed, and that the germinability of the treated seed was improved by dusting it after drying with copper carbonate. At temperatures above 130° the viability of the seed was seriously impaired. The smut was not controlled by heating naturally infected Reward wheat in an electric oven at 212° for

30 minutes, and control was not perfect by drying pre-soaked infected seed for 60 minutes at 150°. Of a number of chemical substances that were tried in aqueous solutions at room temperature none was found to be effective, except a 2 per cent. solution of potassium iodide, which considerably reduced the amount of loose smut in Reward and Ceres wheats, but did not give perfect control.

ZALESSKY (V.). Метод анаэробиоза для борьбы с пыльной головней Пшеницы. [Anaerobic method for the control of loose smut of Wheat.]—*Pl. Prot. Leningrad, 1935*, 1, pp. 135–138, 1935. [Received May, 1936.]

The method briefly described in this paper for the control of wheat loose smut (*Ustilago tritici*) [see preceding abstract] is stated to have been suggested to the author by observations which indicated that the parasite is considerably more susceptible than the wheat grains to the lethal action of anaerobic conditions. In a small range of experiments in 1933 it was found that no smut resulted in the progeny of lots of 100 to 200 grains of the soft wheat Lutescens No. 062 which were kept for 18 to 24 hours entirely submerged in a flask in water deprived of its oxygen (either by distillation or by boiling) at 25° C., whereas the controls gave 24·5 per cent. smut, while in a similar lot of hard wheat (Albidum No. 0721) the percentage of resulting smut was reduced from 28 to 1·5. Saturation of the water with carbon dioxide slightly reduced the efficacy of the treatment. The method is still in the experimental stage and is not recommended for general practice until it has been further tested.

MITRA (M.) & TASLIM (M.). **The control of loose smut of Wheat in North Bihar by the solar energy and sun-heated water methods.**—*Agric. Live-Stk India*, vi, 1, pp. 43–47, 1936.

Experiments conducted during 1934–5 showed that both the solar energy and sun-heated water methods recommended by Luthra and Sattar for the control of loose smut of wheat [*Ustilago tritici*: *R.A.M.*, xiv, p. 22 and preceding abstracts] are applicable under North Bihar conditions. Absolute control was given by both treatments, the former involving exposure of the Punjab S.A. seed-grain after four hours' pre-soaking to the direct rays of the sun from noon till evening and the latter its immersion for the same length of time in water previously warmed by the sun, whereas in the untreated plots the incidence of infection ranged from 1·54 to 2·03 per cent. The seed-grain should be treated after harvesting, well dried, and stored in air-tight containers.

MOORE (M. B.). **Pathogenicity of different collections of Ustilago tritici and U. nuda.**—Abs. in *Phytopathology*, xxvi, 2, p. 103, 1936.

Each of 12 collections of spore material of *Ustilago tritici* from Minnesota, North Dakota, Texas, and Mexico was inoculated by the partial-vacuum method into 6 to 8 heads of each of 9 differential wheat varieties, with the result that 5 parasitic races could be distinguished on the basis of the amount of infection caused, generally either 0 or between 20 and 100 per cent. according to the strain of smut used [cf. *R.A.M.*, xiv, p. 620]. In the case of *U. nuda* on barley [ibid., xv, p. 288]

the outcome of the inoculation tests was less clear-cut, but the Trebi variety showed a high degree of resistance to the 9 collections used.

New applications are found for superphosphate.—*Industr. Engng Chem.*, News Ed., xiii, 20, p. 406, 1935.

Information has been received from the Research Institute for Fertilizers and Insectofungicides (U.S.S.R.) that double superphosphate from apatite and thermic phosphoric acid with a total content of 50·17 per cent. phosphoric acid give satisfactory control of millet [*Panicum miliaceum*] and wheat smuts [*Ustilago panici miliacei* and *Tilletia caries* and *T. foetens*, respectively: *R.A.M.*, xv, pp. 285, 360], when dusted over the seed-grain at the rate of 6 gm. per kg. In field tests the incidence of infection by these diseases was reduced from 30 per cent. to nil. Germination was somewhat impaired in the case of wheat only.

VANTERPOOL (T. C.). **Toxin formation by species of Pythium parasitic on Wheat.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 294–298, 3 figs., 1935.

A summarized account is given of experiments with species of *Pythium* associated with browning root rot of wheat in Canada, but chiefly with *P. arrhenomanes* var. *canadensis* [*R.A.M.*, xiii, p. 758; xv, p. 141], the results of which showed that these fungi, when grown on specific culture media, are capable of excreting toxins which inhibit the germination of wheat and other cereals, and cause a pronounced black discoloration of the grain. The toxic principle was shown to be thermostable; it was removed almost completely by the soil in pot cultures of the hosts, but was still effective after filtration through a 10 cm. column of loamy earth. There was evidence indicating that the principle is toxic to the cytoplasm of the host tissues, but is not able to dissolve the cell walls. It readily caused wilting of tomato plants, but did not inhibit the growth of the fungus on agar. Mycelial extracts, on the other hand, showed no definite toxicity to wheat. Substances toxic to wheat were also shown to be produced on specific media by *Ophiobolus graminis* and, to a less extent, by *Helminthosporium sativum* and *Fusarium culmorum*.

In comparative pathogenicity tests of the wheat foot rot organisms care should be taken to inoculate the soil with cultures of media on which toxins are not produced by the fungi concerned.

MEAD (H. W.). **Seed injury in Wheat and infection by Helminthosporium sativum P., K., & B.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 278–282, 1935.

Greenhouse and field experiments in 1932 at Saskatoon and Muenster, Canada, showed that wheat (Marquis and Reward) seed-grain injured naturally by frost, rust [*Puccinia* spp.], sprouting, or drought, or artificially by formalin treatment, and inoculated before sowing with *Helminthosporium sativum* [*R.A.M.*, xv, p. 86], produced plants which exhibited greater losses from non-emergence and blighting, and considerable reduction in yield, than plants raised from normal seed of the same varieties, inoculated with the same fungus. Reduction in stand and yield also resulted from sowing injured seed-grain without inocula-

tion. The practice is recommended of sowing sound seed as early as possible in soils commonly infected with *H. sativum*.

GLYNNE (MARY D.). **Some new British records of fungi on Wheat. Cercosporella herpotrichoides Fron, Gibellina cerealis Pass., and Ophiobolus herpotrichus (Fr.) Sacc.**—*Trans. Brit. mycol. Soc.*, xx, 2, pp. 120–122, 1936.

In 1935, *Cercosporella herpotrichoides* [*R.A.M.*, xv, p. 352] occurred on wheat at Rothamsted, the disease being fairly common and present on every plot in a field planted every year to wheat since 1843. It was also found occasionally in other fields where wheat is grown in rotation with other crops. This accords with the general view that the disease increases when rotation is inadequate. On potato dextrose agar, the fungus formed hemispherical mounds of grey, velvety mycelium with a pale edge, later growing out over the agar rather slowly and becoming darker on the under surface.

Gibellina cerealis [ibid., xiv, p. 26] was found in May at Rothamsted in a plot where wheat has alternated with fallow without manure since 1856. The fungus caused rotting of the tillers and stunting of the shoots, and was characterized by dark-bordered, elongated lesions on the lower leaf sheaths and basal parts of the culms with a greyish-white mycelial felt penetrating and uniting the leaf sheaths, and developing into a stroma with darker cells below. Numerous pale perithecia with black, protruding beaks were embedded in the stroma and ripened from June onwards. The perithecia measured 315 to 600 by 285 to 570 μ and the beak 285 to 455 by 125 to 220 μ, the asci 90 to 125 by 13 to 18 μ, and the uniseptate, hyaline, later honey-coloured to hazel and rarely biseptate ascospores from 23 to 36 by 7 to 11 μ. Paraphyses were present. Cultures on potato dextrose agar developed as white mounds which later sometimes turned pale grey; numerous fertile perithecia developed in cultures about five weeks old.

Ripe perithecia of *Ophiobolus herpotrichus* [ibid., xiv, pp. 124, 569] were found at Rothamsted in March on wheat stubble overwintered in the soil. No evidence of parasitism was obtained. Cultures on potato dextrose agar were whitish-grey or brownish, often showing dark and light areas. In Great Britain the fungus has been recorded on wild grasses, but not before on wheat.

DASTUR (J. F.). **Microscopic characters of the black point disease of Wheat in the Central Provinces.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 253–255, 1 fig., 1935.

The author states that a condition of wheat grains closely resembling that described as black point in St. Martin Argentine wheat by Pasinetti in 1931 [*R.A.M.*, xi, p. 100] occurs in the Central Provinces of India. The only important point of difference is that while no organisms were found by Pasinetti in the discoloured grains, bacteria and species of *Helminthosporium*, *Cladosporium*, *Ophiobolus*, and *Fusarium* were shown to be present in the Indian wheats, even though seed-grain thus affected may germinate, in the majority of cases, and produce normal plants. In a few cases, however, black-point wheat grains failed to show the presence in them of any organism, independently of whether they

germinated normally or not at all. Hyphae were observed inside the affected grains in great abundance in the funicle and in the pericarp in the central region of the grain furrow; they creep between the pericarp and the seed coat, where they form a kind of stroma, and also occur in the coleoptile and in crushed cells behind the scutellum. No evidence of mycelium was found in the embryo, aleurone layer, or starch cells of the endosperm.

REED (G. M.) & STANTON (T. R.). **Reaction of Oat varieties to physiologic races of loose and covered smuts of red Oats.**—*J. agric. Res.*, lii, 1, pp. 1–16, 1936.

A tabulated account is given of experiments from 1931 to 1934, inclusive, at Brooklyn, in which the reaction was tested of 34 strains or varieties of eight species of *Avena* to five collections of covered smut (*Ustilago levis*) [*U. kolleri*] (four from Fulghum oats [*R.A.M.*, xi, p. 506; xiv, p. 574] in Georgia and South Carolina, and one from Black Mesdag in North Dakota), and to nine collections of loose smut (*U. avenae*) [loc. cit. and ibid., xv, p. 354] from the southern oat-growing area of the United States, collected on four varieties, including Fulghum. The Fulghum races of both species showed very distinct differences in their reaction on the various oat varieties tested. Both groups severely attacked the strains of Fulghum but were negative on certain other varieties, such as Navarro and Red Rustproof; they also attacked severely some varieties of the *Avena sativa* group, while other varieties were completely resistant to loose smut but susceptible to the covered smut. Generally speaking, all the collections were very similar in behaviour on many oat varieties, but some evidence was obtained indicating that specialized subraces may exist. A strain of loose smut occurring on Red Rustproof was shown to be distinct from the others, and Canadian (a variety of *A. sativa*) and strains of *A. fatua* and *A. strigosa* were shown to be susceptible to it. Markton and Navarro oats stood out by their complete resistance to all the collections of the two species of smut.

Der Schneeschimmel. [The snow fungus.]—*Landwirt, Novisad*, iv, 3, p. 22, 1936.

A popular note is given on the occurrence and control of the snow fungus (*Fusarium* spp.) [including *Calonectria graminicola*] of winter cereals, especially rye, in Jugo-Slavia. The damage from this source may be mitigated by breaking up the snow cover to admit air to the plants, accelerating the process of thawing and simultaneously providing a good potash manure by strewing wood ash over the surface, and (in the absence of snow) applying a top dressing of calcium cyanamide at the rate of 50 kg. per Joch [1·42 acres].

IVANOFF (S. S.) & RIKER (A. J.). **Genetic types of resistance to bacterial wilt of Corn.**—Abs. in *Phytopathology*, xxvi, 2, pp. 95–96, 1936.

The existence of three types of resistance to bacterial wilt of maize (*Phytomonas* [*Aplanobacter*] *stewarti*) [*R.A.M.*, xv, p. 282] has been revealed by extensive studies on Golden Bantam inbreds and F_1 hybrids, various commercial crosses, and open-pollinated sweet, dent,

and flint types, viz., vigour-correlated (vigour measured by height), lateness-correlated, and 'true' resistance. Generally speaking, hybrids produced from low-resistant inbreds showed less resistance than those derived from high-resistant ones, but the degree of resistance in the former was greater than that of either of the parents; hybrids from high-resistant inbreds were approximately equal in resistance to their parents. On the whole hybrid resistance seems to be mainly influenced by the resistant parent. Open-pollinated sweet corn varieties showed about the same degree of resistance as the comparable dent and flint types.

HIRSCHHORN (ELISA) & HIRSCHHORN (J.). **Los carbones del Maiz en la Argentina. Carácteres sistemáticos, genéticos y parasitarios. (Observaciones preliminares.)** [Maize smuts in the Argentine. Systematic, genetic, and parasitic characters. (Preliminary observations.)]—*Rec. Fac. Agron. La Plata*, xx, 2, pp. 108–139, 4 pl., 1935. [English summary. Received March, 1936.]

Maize smut in the Argentine has hitherto been attributed exclusively to *Ustilago zeae* [*R.A.M.*, vii, p. 796] and *U. abortifera*, described by Spegazzini from Salta in 1881 and not observed since, but the authors' extensive studies on the systematic position, biology, and pathogenicity of diseased material from 22 localities, together with samples from Uruguay and Venezuela, revealed an extremely complex situation. The affected organs and the smut galls were found to contain a mixture of chlamydospores of *U. zeae* (predominating), *Sorosporium reilianum* (only in one sample in a pure state) [ibid., xv, p. 360], and *U.* (?) *fisheri*. The results of inoculation experiments with the progeny of a phenotype of *S. reilianum* clearly established the hybrid character of the smut by demonstrating the segregation of typical chlamydospores of the three smuts with others of an intermediate character, suggesting the possibility of spontaneous crossing. Chlamydospore production in *U. zeae* was more rapid than in *S. reilianum*; the chlamydospores of the latter formed on potato dextrose agar failed to germinate in a moist chamber. The suspected identity of *U. abortifera* with *S. reilianum* was confirmed by comparative studies.

ELLIOTT (CHARLOTTE), MELCHERS (L. E.), LEFEBVRE (C. L.), & WAGNER (F. A.). **Pythium root rot of Milo.**—Abs. in *Phytopathology*, xxvi, 2, p. 92, 1936.

The fungus responsible for the root rot which has been causing heavy damage to milo sorghums in the south-western United States during the last ten years [*R.A.M.*, xi, p. 507] has been identified as *Pythium arrhenomanes* [ibid., xv, p. 141]. The kafir and sorgo types tested for their reaction to the disease are resistant or immune, while resistant strains have also been developed from susceptible milos.

JENKINS (ANNA E.). **Australian Citrus scab caused by Sphaceloma fawcettii scabiosa.**—*Phytopathology*, xxvi, 2, pp. 195–197, 1 fig., 1936.

An examination of citrus scab material from Queensland dating from 1876 and labelled (probably by McAlpine) *Ramularia scabiosa* showed

the fungus concerned to be identical with that on a similar specimen from New South Wales and closely related to *Sphaceloma fawcettii* [*R.A.M.*, xv, p. 362], from which it differs, however, in its larger conidiophores and greyish, hair-brown or fuscous conidia (10 to 17 by 2·5 to 5 μ). The lesions produced by the Australasian fungus are also larger and more regularly discoid or crateriform than those of the Florida disease. Pending further investigations the name of *S. fawcettii scabiosa* is suggested for *R. scabiosa*. The Queensland record is stated to be the first definite one of a *Sphaceloma* disease of citrus in any country.

VENKATARAYAN (S. V.). **The biology of Ganoderma lucidum on Areca and Cocoanut Palms.**—*Phytopathology*, xxvi, 2, pp. 153–175, 6 figs., 1936.

The inoculation of sterilized fragments of *Areca catechu* tissue with pure cultures of *Ganoderma lucidum* [*R.A.M.*, xiv, p. 693; xv, p. 78] from the same host in Mysore resulted in the development of sporophores with true pilei. The fungus was found to secrete diastase, laccase, invertase, protease, coagulase, rennetase, and oxidase. The decay induced by *G. lucidum* is of the 'brown rot' or 'destruction' type [ibid., ix, p. 150], but a transition to the 'corrosion' phase is indicated by the capacity of the organism for tannin utilization. The growth range of the pathogen was found to extend from P_H 3 to 7 with an optimum at P_H 6·5.

The parasitism of *G. lucidum* appears to be of a very gradual order. Large pieces of inoculum cultivated on *Cassia siamea* roots were placed in proximity to living areca palms, the roots of which were found five months later to be permeated and discoloured. Inoculations of four coco-nut palms through holes bored in the trunk with the fungus from this host caused the typical bleeding (though but slightly developed) within six months, whereas the control trees were unaffected.

JURION (F.). **La brûlure des Caféiers.** [Coffee black tip.]—*Publ. Inst. nat. Étud. agron. Congo belge, Sér. Sci.* 6, 19 pp., 29 figs, 4 graphs, 1936.

Coffea arabica growing on mountains of 2,000 to 2,100 m. and in valleys of 1,650 to 1,750 m. elevation in the Belgian Congo is affected by a physiological disease 'black tip' (also recorded by A. D. Trench from Kenya under the name 'hot and cold disease'—*Kenya Bull.* 14, 1932) characteristic of these localities, which are subject to sudden drops in temperature and heavy humidity, factors seldom obtaining at intermediate altitudes (1,800 to 1,900 m.). The affected trees appear as if frost-bitten; most of the leaves and unlignified shoots are destroyed, and after the death of the terminal buds the trees assume a stunted aspect, the internodes being very short, while an enormous number of secondary branches is formed.

The process by which black tip becomes established is as follows. At sunrise sudden evaporation takes place from the cold, dewy leaves which still further reduces their temperature. When temperature suddenly rises, as it does a little later, conditions are set up in the leaves resembling those due to the effects of frost followed by rapid thawing on living tissues. The succeeding intense transpiration due to heat

destroys the turgescence necessary to the life of the cell and the tissues become burned and die.

The effect of shade is to reduce sudden variations in temperature and in the rainy season to reduce the formation of dew during the night. To be effective the shade must be flat and very regular, without gaps. Rapidly growing shade trees should be planted before the coffee. Resistant types of coffee (viz., those with brown shoots) may be planted with seed taken from resistant but not immune types, the latter lacking resistance to drought.

Progress Reports from Experiment Stations, season 1934–1935.—v+144 pp., 19 graphs, 1 plan, London, Empire Cotton Growing Corporation, 1936.

This compilation of reports for 1934–5 from the various stations of the Empire Cotton Growing Corporation [cf. *R.A.M.*, xiv, p. 357] contains, *inter alia*, the following items of phytopathological interest.

In experiments at Barberton, South Africa, on the insect transmission of internal boll disease (*Nematospora gossypii*) [and *N. coryli*: loc. cit], samples of stainers (*Dysdercus* spp.) collected each week from *Sterculia* trees were tested on sterile cotton bolls. Adults of *D. nigrofasciatus* and *D. intermedius* from both the migrant and F_1 generation on the trees were found to be carrying *N. gossypii*, 13 per cent. being infected. *Sterculia* fruits showed *N. gossypii* abundantly present inside the seed. Adults of *Odontopus confusus*, an insect very commonly associated with *S. rogersii*, were found to be heavily infected with *N. gossypii*, and as the insect passes its whole existence on the tree it may possibly carry over infection from one season's fruit to the next.

In Tanganyika Territory internal boll disease [*N. gossypii* and *N. coryli*: ibid., xiv, p. 97] was present in all the local cotton-growing areas, though the Moshi area was exceptionally healthy.

A wilt extensively present in two cotton fields at the Magut experiment station, Natal, and which had affected only an occasional plant during the two preceding seasons, was caused by a species of *Verticillium* recorded from America [ibid., xiv, p. 629] and from Cape Province. The two affected fields were not adjacent and were planted with different strains of cotton; when identical seed was planted in other parts of the station no disease appeared.

In further breeding work in the Sudan against blackarm (*Bacterium malvacearum*) [ibid., xiv, p. 358] trials with new hybrids from Nye's Uganda types, crossed with 513 and 514, showed the F_1 plants to be intermediate in resistance, the 513 hybrids being appreciably more resistant than the 514 hybrids. Families from the resistant parents retained their resistance.

In breeding experiments at Serere, Uganda, despite very heavy blackarm infection on the control rows of S.G. 29, many strains showed marked tolerance, and there seems to be every hope that it will soon be possible to replace S.G. 29 with one of the U. 4/4/2 derivatives without much loss of lint quality. During the past five seasons, however, cotton strains have been produced in Uganda which are so highly resistant to blackarm that dusting becomes unnecessary.

In a large experiment of complex type, designed as a combined

variety, dusting, and sowing date trial, carried out at Serere, dusting with 413a and abavit B [ibid., xiv, p. 82] significantly increased yield in the plots sown in June; no difference was shown between the dusted and undusted plots sown in April, May, and July. In a miniature varietal test the discarded control variety N. 17 gave a significantly higher yield and fewer blackarm lesions than S.G. 29, used at present; all the selections showed considerably less blackarm than N. 17 or S.G. 29, and the more recent U. 4/4/2 derivatives gave particularly high yields [ibid., xiv, p. 358]. Owing to unfavourable weather and severe blackarm infection the yields obtained at Serere and in the Eastern Province were below the average, but there is every prospect that such resistant strains as S.P. 87 will prove a success in the Eastern Division.

At Ibadan, Nigeria, wet conditions favoured blackarm and the loss of crop was severe. In Tanganyika the angular leaf spot was rather more common than usual, but the disease was not sufficiently prevalent to justify control measures.

Taubenhaus (J. J.) & Christenson (L. D.). **Insects as possible distributors of Phymatotrichum root rot.**—*Mycologia*, xxviii, 1, pp. 7–9, 1936.

When three species of soil-inhabiting insects were caged and fed on cotton roots covered with a copious growth of *Phymatotrichum omnivorum* [*R.A.M.*, xiv, p. 629] the fungus could not be reisolated from the faecal pellets or the insects themselves. Negative results were also obtained by feeding the insects on cotton leaves heavily coated with the spores of the fungus and on a sweetened solution containing a heavy suspension of the spores. It therefore appears to be probable that insects are not associated with the spread of *P. omnivorum*.

Taubenhaus (J. J.) & Ezekiel (W. N.). **Longevity of sclerotia of Phymatotrichum omnivorum in moist soil in the laboratory.**—*Amer. J. Bot.*, xxiii, 1, pp. 10–12, 1 fig., 1936.

The authors state that the results of experiments, in which sclerotia of *Phymatotrichum omnivorum* [see preceding abstract], collected in 1929 from carrots in Texas, were kept for varying periods of time up to five years in the laboratory in stoppered vials with water, dry soil, or clay soil containing varying percentages of moisture, showed that the sclerotia in air-dry soil lost their viability before the first germination test, which was made nine days after the beginning of the experiment. Those in water and in soil with 10, 50, or 60 per cent. moisture were still viable at that date, but none germinated in the second test, one year later. In soils, however, with 20, 30, or 40 per cent. moisture, the sclerotia were still able to germinate at the end of five years and to cause typical root rot of cotton seedlings.

Rogers (C. H.). **Apparatus and procedure for separating Cotton root rot sclerotia from soil samples.**—*J. agric. Res.*, lii, 1, pp. 73–79, 3 figs., 1936.

After a brief reference to the difficulties presented by the methods hitherto used to separate the sclerotia of *Phymatotrichum omnivorum* [see preceding abstracts] from the soil, an account is given of the con-

struction and working of an apparatus which is claimed to be able to handle from two to four tons of soil per working day. In principle it consists of a vertically mounted, coarse-mesh cylinder screen with a fine-mesh horizontal screen below; the material is first washed through the coarse screen, drops on the fine-mesh screen, and is then passed on to a finer screen partially submerged in water and moving in a reciprocating manner. The sclerotia are separated from the resulting residue left on the screens by stirring in a sugar-solution with a specific gravity of 1·15 to 1·25 which is sufficient to allow the sclerotia to float to the surface. Their viability is not affected by the sugar solution.

PARHAM (B. E. V.). **Mycological notes—mortality in larvae of Teleonemia lantanae.**—*Agric. J. Fiji*, viii, 1, p. 31, 1935. [Received May, 1936.]

Heavy mortality among the final instar larvae and adults of *Teleonemia lantanae* in Fiji (where the insect was introduced in 1928 for the biological control of *Lantana crocea*) has been ascertained to be partly due to infection by a species of *Hirsutella* resembling *H. citriformis*, recorded from Ceylon [cf. *R.A.M.*, iii, p. 335], New Zealand, and elsewhere.

WINGARD (S. A.). **Parasitism of the Apple leaf hopper, Typhlocyba pomaria, by Entomophthora.**—Abs. in *Phytopathology*, xxvi, 2, p. 113, 1936.

The examination of a large number of dead apple leafhoppers (*Typhlocyba pomaria*), which occurred in a destructive form in Virginia orchards in August, 1935, showed that the insects had been parasitized by a fungus apparently identical with *Entomophthora sphaerosperma* [*R.A.M.*, xv, p. 18].

YING (S. H.). **Yeast-like fungi in sputa of tuberculous patients.**—*J. trop. Med.* (*Hyg.*), xxxix, 1, pp. 4–9, 4 figs., 1936.

Nine strains of yeast-like fungi were isolated from 100 cases of pulmonary tuberculosis at the Shanghai National Medical College and one from 20 patients with normal lungs. According to their biochemical properties the strains in the pathological group belong to *Monilia* (*Cryptococcus*) *macroglossiae* [*R.A.M.*, v, p. 365], *M.* [*Candida*] *pinoyi*, *M.* [*C.*] *krusei* [ibid., xv, p. 20], *M. bronchitica*, and *M.* [*C.*] *tropicalis* [ibid., xiv, p. 759], while the normal sputum yielded *M. bronchitica*. The results of animal inoculations established the greater virulence of the organisms from tuberculous patients.

OBRTEL (J.). **Ekzema serpiginosum epidermophyticum (Epidermophyton rubrum Castellani-Bang).**—*Derm. Wschr.*, cii, 6, pp. 168–172, 2 figs., 1936. [German.]

From 7 out of 400 cases of dermatomycosis investigated at Prague the writer isolated a fungus of rare occurrence in Europe—*Epidermophyton* [*Trichophyton*] *rubrum* [*R.A.M.*, xv, p. 219]—which has been reported chiefly from the United States, the East, and Japan. Clinical details of the cases are given.

HASEGAWA (M.) & YAMAMOTO (K.). **Über einen bei Affen gezüchteten Pilz: Microsporon fulvum.** [On a fungus cultured from apes: *Microsporon fulvum.*]—*Jap. J. Derm. Urol.*, xxxix, 2, pp. 23–25, 5 figs., 1936.

A fungus agreeing in symptomatological, cultural, and morphological characters with *Microsporon fulvum*, an agent of kerion celsi on man in Japan [*R.A.M.*, xii, p. 291], was isolated from three apes (*Macacus cynomolgus*) imported from the South Sea Islands. After 13 days on Sabouraud's maltose agar at room temperature, the colonies of the fungus were yellowish-brown with a powdery surface and encircled by a downy, white fringe. The slender hyphae showed piriform swellings and bore laterally long chains of spores; chlamydospores, nodular organs, and a profusion of spindle spores, mostly quinqueseptate, were also produced. Positive results were given by experiments in the transmission of the fungus to man.

CASTELLI (T.). **L'uso della silice gelatinosa per lo studio della sporificazione dei Blastomiceti.** [The use of silica gel for the study of spore formation in the Blastomycetes.]—*Boll. Ist. sieroter. Milano*, October, 1935. [Abs. in *Boll. tec. Tab.*, xxxii, 4, pp. 321–322, 1935.]

A silica gel medium is stated to have proved very superior to malt agar and Gorodkowa's agar for the culture of various strains of Blastomycetes, inducing rapid and abundant spore formation.

SORENSEN (C. M.) & PARFITT (E. H.). **Types of Oospora found in butter.**—Abs. in *J. Bact.*, xxxi, 1, pp. 86–87, 1936.

Eight distinct varieties of *Oospora lactis* were differentiated in the course of an examination of acidulated potato dextrose agar plates of pasteurized commercial sour cream butter [*R.A.M.*, xiv, p. 761] at Purdue University [Indiana]. Further studies revealed significant differences among the varieties as to caseolysis, lipolysis of milk and tributyrin, growth rate, optimum temperature, majority thermal death-point, and caseolytic and lipolytic enzyme production.

VANTERPOOL (T. C.). **Seedling damage of Flax caused by Rhizoctonia solani and Pythium debaryanum.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 300–302, 3 figs., 1935.

This is a very brief account of laboratory and field studies the results of which have shown that the severe early damping-off of flax which has occurred since 1930 in many parts of Saskatchewan is due almost exclusively to *Rhizoctonia* [*Corticium*] *solani* [cf. *R.A.M.*, iv, p. 443; xiv, p. 362], while in moister localities a contributory part in the etiology of the trouble may also be played by *Pythium de Baryanum* [ibid., x, p. 732]. Traces were also found of early seedling injury being caused by *Fusarium* spp., but typical wilt due to these organisms only attained some importance later in the season. The results also indicated that a measure of control of damping-off may be obtained by rotating dicotyledonous with monocotyledonous crops.

FLOR (H. H.). **Browning disease of Flax in the United States.**—Abs. in *Phytopathology*, xxvi, 2, pp. 93–94, 1936.

During the last three years the browning disease of flax (*Polyspora lini*) [*R.A.M.*, xv, p. 369], which before 1932 was known to occur in the United States only in Michigan, has been detected in Iowa, Minnesota, North Dakota, and Oregon. A survey of the flax fields of Southern Minnesota and Northern Iowa in 1935 revealed the stem-canker phase of the disease in a severe form in 23 per cent. of those inspected, the incidence of infected plants ranging from a trace to 15 per cent. In the eastern half of North Dakota browning was also found to be widespread but apparently causing little damage. Among the commercial seed-flax varieties, Bison has shown the greatest susceptibility to *P. lini*, followed in decreasing order by Red Wing, Linota, Buda, and Rio; the yield of the first-named in inoculated plots was reduced to 61 per cent. of the normal and the average weight per seed to 85 per cent. of that from the controls.

GARASSINI (L. A.). **El 'pasmo' del Lino Phlyctaena? linicola Speg. Ensayo a campo de resistencia varietal y estudio morfológico y fisiológico del parásito.** ['Pasmo' of Flax. ? *Phlyctaena linicola* Speg. Field experiment on varietal resistance and a morphological and physiological study of the parasite.]—*Rev. Fac. Agron. La Plata*, xx, 2, pp. 170–261, 19 figs., 19 graphs, 1 map, 1 plan, 1935. [Received March, 1936.]

An exhaustive, fully tabulated account is given of recent field and laboratory studies in the Argentine on the varietal reaction of flax to the 'pasmo' [spasm] disease (*Phlyctaena linicola*) [*R.A.M.*, xi, p. 300; xv, p. 399] (for which the name of *Septoria linicola* (Speg.) nov. comb. was substituted in a paper read by the writer at a meeting on 27th September, 1935, of the Agricultural Study Centre, National University of La Plata).

The results of artificial inoculation experiments on 1,000 plants of each of 30 varieties of different origin substantiated Rodenhiser's conclusions [ibid., x, p. 315] as to the high degree of susceptibility of the Argentine as compared with the North American types; among the latter Bolley 134 and 187 and Buda N.D.R. 119 Boll. were relatively resistant, the first-named also behaving similarly in laboratory tests.

In seven different culture media the colonies of the fungus showed morphological variations, potato glucose agar giving the most satisfactory growth and sporulation. With the exception of sweet potato agar, all the media used reduced the length of the spores compared with that obtained on the natural substratum (26·45 by 3·24 μ), the effect of oatmeal agar being particularly marked in this respect (20·60 by 2·88 μ); the corresponding length figures for potato glucose, sweet potato, carrot, maize, and Czapek's agars were 21·50, 25·45, 23·15, 24·20, and 21·45 μ, respectively. The optimum temperature for the development of the fungus was found to be 24° C. The data given by Spegazzini and Brentzel for the pycnidial dimensions [ibid., v, p. 366] were confirmed in these investigations.

A bibliography of 83 titles is appended.

GREEN (D. E.). **Snowdrop mould.**—*Gdnrs' Chron.*, xcix, 2563, pp. 93–94, 4 figs., 1936.

A very brief popular account is given of the snowdrop (*Galanthus nivalis*) disease, commonly known in England as mildew or white mould, which is caused by *Botrytis galanthina* [*R.A.M.*, viii, p. 41; xi, p. 460]. Though comparatively rare, the disease is stated to be more commonly found in the northern than in the southern counties, and to be encouraged by humid conditions and waterlogged soil. Control measures recommended are the removal and destruction of infected bulbs, the use of healthy stock, and the disinfection with formalin of beds before planting.

GREEN (D. E.). **Antirrhinum rust: II. The results of spraying and dusting with fungicides.**—*J.R. hort. Soc.*, lxi, 2, pp. 64–76, 2 figs., 1 map, 1936.

A tabulated account is given of the writer's experiments at the Royal Horticultural Society's Garden, Wisley, Surrey, in 1935 in the control of *Antirrhinum* rust (*Puccinia antirrhini*) [*R.A.M.*, xiii, p. 445; xv, p. 371]. The trials comprised 104 plots of 40 Malmaison plants each planted out on 28th May; spraying commenced on 1st July and further treatments were applied at fortnightly intervals. In spite of artificial inoculation the disease did not spread to any appreciable extent until about 9th September, the pustules in the early stages of infection being continuously eaten away by the larvae of *Mycodiplosis* spp. [ibid., v, p. 314].

A careful analysis of the condition of the plants in the treated plots indicated that the best results were given by Burgundy mixture 4–5–50 and Bordeaux mixture 4–6–50 (both used with saponin added at the rate of 2 oz. to 100 galls.), the former being slightly superior, especially where fewer applications were made; neither of these preparations, however, was fully satisfactory, the average marks for healthiness awarded to the plots thus treated being only 112 and 153, respectively, out of a possible 320. None of the other treatments proved even moderately effective. It may be considered doubtful whether *P. antirrhini* can be completely controlled by fungicidal treatments under ordinary outdoor conditions in Great Britain, and experiments are in progress to develop rust-resistant selections. So far some 77 per cent. of a resistant stock of 550 plants have remained free from the disease notwithstanding exposure to natural and artificial infection.

FERRARIS (T.). **Quadretti fitopatologici.** [Phytopathological notes.]—*Riv. agric., Roma*, xxxii, 724, pp. 26–27, 1936.

In September, 1935, *Pelargonium zonale* plants growing in various localities in Piedmont, developed dry yellowish to reddish-brown spots on the leaves, which gradually dried up and fell off, infection being found to be due to *Macrosporium macalpineanum*, a species allied to *M. pelargonii* [*R.A.M.*, xiv, p. 681]. Three applications of 1 per cent. Caffaro powder were effectual against the disease in the greenhouse, but on plants left in the open and exposed to the rain the disease continued to spread. During the rainy weather the plants became severely infected

with *Botrytis vulgaris* [*B. cinerea*], the spread of which was checked by repeated applications of quicklime and sulphur mixed in equal proportions. Cinerarias [*Senecio cruentus*] in Italy are liable to become infected by *Bremia lactucae* [ibid., xiv, p. 683], the upper surfaces of the leaves developing yellowish, later reddish, irregular spots causing withering and defoliation. Infection passes rapidly from leaf to leaf and the plant soon wilts and dies. The disease may be avoided by keeping the plants in warm but not over-damp conditions, airing them frequently, and spraying lightly from time to time with a cupric mixture at a concentration of 0·3 to 0·5 per mille. If the lower leaves (the first to be attacked) are already affected they must be removed and the plants treated with 0·5 per cent. Bordeaux mixture or Caffaro powder.

LAUBERT (R.). **Eine neue Begonienkrankheit.** [A new Begonia disease.] —*Kranke Pflanze*, xiii, 2, p. 31, 1936.

In December, 1935, the writer observed on hybrid begonia leaves of the Konkurrent and Konkurrent compacta varieties in a west German nursery a mildew (*Oidium*) [*O. begoniae*] causing small, discoloured, pale to light brownish spots, occasionally spreading over the whole surface in the form of a chalk-white efflorescence. Barrel-shaped conidia, 25 to 34 by 12 to 15 μ, were produced in immense numbers but no perithecia. There appears to be no previous record of a species of *Oidium* on this host [but see *R.A.M.*, xiv, p. 447] and it is thought probable that in the present instance the fungus spread to the begonias from some neighbouring plant. In this connexion attention is drawn to the widespread increase of destructive plant mildews in Germany and Europe generally of recent decades [cf. ibid., xii, p. 578].

WASEWITZ (H.). **Schäden durch die Blattfleckenkrankheit der Cinerarien.** [Damage from the leaf spot disease of Cinerarias.]—*Blumen- u. PflBau ver. Gartenwelt*, xl, 9, pp. 99–100, 1936.

Cinerarias [*Senecio cruentus*] in the Frankfurt-am-Main district of Germany are stated to have suffered severely of recent years from the attacks of *Ascochyta cinerariae*, the agent of a circular, brown to black spotting of the foliage, which ultimately shrivels or rots, rendering the plants unmarketable. The oval spores of the fungus drop from the lesions to the ground and perpetuate the disease through the soil. For control of the disease sanitary measures should be supplemented if necessary by soil disinfection with formalin.

DODGE (B. O.). **Notes on some bacterial and fungous diseases in our gardens.**—*J.N.Y. bot. Gdn*, xxxvii, 434, pp. 29–33, 2 figs., 1936.

In connexion with a few popular observations on the occurrence and control of some well-known bacterial and fungous diseases of ornamentals [reference to which has frequently been made in this *Review*], the writer mentions the fact that fireblight of pears (*Bacillus amylovorus*) [*R.A.M.*, xiv, p. 702] is becoming established in the United States on a number of ornamentals of the apple group, such as hawthorns [*Crataegus* spp.], flowering crabs, shadbush [*Amelanchier canadensis*], quince, and mountain ash [*Pyrus aucuparia*].

SMITH (K. M.). **The virus diseases of glasshouse and garden plants.**—*Sci. Hort.* [formerly *H.E.A. Yearb.*], iv, pp. 126–140, 8 figs., 1936.

After pointing out that in recent years virus diseases of ornamental flowering plants have increased both in number and in economic importance, the author briefly reviews the chief characteristics of this type of infection, and gives short notes on the symptoms set up by the tomato spotted wilt virus [*R.A.M.*, xiv, pp. 404, 763; xv, p. 324] on *Callistephus chinensis*, *Calendula*, chrysanthemum, cineraria [*Senecio cruentus*], dahlia [ibid., xv, p. 280], zinnia, lettuce, *Solanum capsicastrum*, *Streptosolen jamesonii*, eggplant, chilli pepper (*Capsicum annuum*), Cape gooseberry (*Physalis*) [*peruviana*], *Petunia*, *Salpiglossis* spp., tobacco, garden nasturtium (*Tropaeolum* spp.), *Papaver nudicaule*, begonia, *Primula*, *Campanula pyramidalis*, *Trachelium* sp., calceolaria, *Gloxinia*, lupin, delphinium, *Zantedeschia aethiopica* [ibid., xiv, p. 725], and *Hippeastrum* sp.; by cucumber virus 1 [ibid., xiv, p. 811] on *Callistephus chinensis*, *Calendula*, delphinium, lupin, pansy [*Viola tricolor*], *Primula obconica*, and *P. sinensis*, polyanthus [*P. elatior*], and *Lobelia cardinalis*; together with notes on cabbage mosaic [ibid., xv, p. 97], mosaic or stripe of narcissi and other bulbous plants [ibid., xi, p. 785], tulip breaking [ibid., xv, p. 156], lily mosaic [ibid., xiv, p. 764] and rosette or yellow flat [ibid., xiv, p. 165], and pelargonium leaf curl [ibid., xii, p. 223]. The paper concludes with practical recommendations for control.

HUSZ (B.). **Néhány hervadásos növénybetegség hazánkból.** [Some wilt diseases of cultivated plants.]—*Bot. Közl.*, xxxii, 1–6, pp. 38–51, 4 figs., 1935. [German summary.]

Hot, dry summers, such as that of 1932 in Hungary, with high soil temperatures, are stated to favour the development of *Fusarium* diseases of plants, both in the form of tracheomycoses and in that of root rots. The Autumn Rose potato appears to be particularly liable to infection by *Fusarium oxysporum*, which did not occur on Prof. Wohltmann. A *Fusarium* tracheomycosis was further observed in lupins [cf. *R.A.M.*, xiv, p. 109], *Capsicum annuum* [cf. ibid., xiv, pp. 7, 720], and carrots [cf. ibid., xii, p. 4]. *Phlox decussata* was found to be attacked by various species of *Fusarium*, some belonging to the section *Martiella* and others undetermined, which caused a rotting of the cortical parenchyma extending upwards from the roots and involving yellowing and desiccation of the plants. Other hosts of this group of organisms included *Dahlia variabilis*, tomatoes, *Callistephus chinensis*, peach, and *Pelargonium*, and *Pinus* [*laricio* var.] *austriaca* seedlings.

A species of *Verticillium* isolated from *Phlox decussata* on sandy soil was identified, on the basis of its morphological characters (mycelium 1·5 to 2 or 3·5 to 4 μ in diameter, conidia 4 to 7 by 1·5 to 3·5 μ, microsclerotia under 90 μ), as *V. albo-atrum* sensu Wollenweber [ibid., iv, p. 495; cf. also xii, p. 338]. There is stated to be only one previous definite record of this fungus in Hungary, where it was observed by G. Moesz on potatoes (*TermTud. Közl.*, p. 15, 1928). In the writer's opinion the economic importance of *V. albo-atrum* in Hungary is likely to be negligible, since the high soil temperatures prevailing from July to September are as detrimental to it as they are conducive to the

spread of *Fusarium*. The vascular bundles of diseased potatoes yielded *Colletotrichum atramentarium* [ibid., xiv, p. 466; xv, p. 370] in addition to *F. oxysporum* [ibid., xiii, p. 651], the taxonomy of which is discussed on the basis of Wollenweber's Monograph [ibid., xv, p. 321].

PADWICK (G. W.) & HENRY (A. W.). **Studies on the temperature and host relations of Ustilago bromivora (Tul.) Fisch. V. Waldh. causing smut of Agropyron species.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 248–253, 1 fig., 1 graph, 1935.

In the tests briefly described and tabulated in this paper, heavy infection of western rye grass (*Agropyron tenerum*) with smut (*Ustilago bromivora*) [*R.A.M.*, v, p. 741; xiv, pp. 493, 572] resulted when the seeds from which the plants were raised were dusted with smut spores from this host and then germinated at different temperatures ranging from 3° to 28° C. In distilled water the spores of *U. bromivora* germinated at temperatures from 8° to 29·5°, with an apparent optimum between 10° and 15°. These results indicate that the smut under Canadian conditions cannot be controlled by regulating the date of sowing the grass. The results of host range tests showed that *A. griffithsii*, *A. dasystachyum*, and *A. richardsonii* are also susceptible to the smut strain from *A. tenerum* used, although they were less heavily attacked than the last named. Seven other species, including *A. cristatum*, did not contract infection.

'Brown patch' fungus disease (Rhizoctonia sp.) infesting cultivated turf grasses of Queensland.—*Bull. Qd Bd Greenkeep. Res.* 2, pp. 8–16, 1936. [Mimeographed.]

Since 1933, the year of its first record from Queensland, the 'brown patch' disease of lawn turf [*R.A.M.*, xiv, p. 449] has become one of the most serious problems of practically every golf course and bowling green within the Greater Brisbane area, and in numerous country centres of that State. The only organism definitely associated with the disease was an unidentified species of *Rhizoctonia*, and inoculations with this fungus on pots of healthy turf of *Digitaria didactyla* [*Panicum didactylum*] reproduced the typical symptoms. Besides *P. didactylum* species of *Agrostis* were extremely susceptible, while *Cynodon dactylon* showed apparently much greater resistance. In experiments on control made in 1935 the applications of mercuric chloride and especially calomel [mercurous chloride: ibid., xiv, p. 562] gave good results.

SANFORD (G. B.) & CORMACK (M. W.). **On varietal resistance of Medicago and Melilotus to root rots caused by Sclerotinia sp. and Plenodomus meliloti D. & S.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 290–293, 1 fig., 1935.

The results of field experiments in Alberta from 1931 to 1933 indicated that lucerne is much more resistant than sweet clover (*Melilotus* spp.) [*M. alba* and *M. officinalis*] to the *Sclerotinia* sp. [*R.A.M.*, xiv, p. 175] used in the work, and that this fungus was still alive in the soil and capable of attacking the hosts a year after having been added to the soil, while inoculum of *Plenodomus meliloti* [loc. cit.] lost its infectivity within the same period. There also was clear evidence that certain

varieties of lucerne and more especially of sweet clover are more resistant than others to the *S.* sp., and that varieties of the *M. officinalis* group were less susceptible than those of the *M. alba* group. No conclusive results could be obtained in regard to resistance of both hosts to *P. meliloti* in the absence of a satisfactory method of soil infection with this organism. There was some evidence that winter hardiness in both lucerne and sweet clover is closely related to their natural resistance to disease, at least in so far as the winter dormancy period is concerned.

JAMALAINEN (E. A.). **Omenan kuoppataudista ja sen esiintymisestä Suomessa.** [Cork disease of Apples and its appearance in Finland.] —*Maataloust. Aikakausk.*, viii, 1, pp. 24–35, 4 figs., 1936. [English summary.]

A description is given of cork disease of apples [cf. *R.A.M.*, xiv, p. 770, and next abstract] (known in Finland as the 'cavity disease'), a marked feature of which is the presence of cavities on the surface of the green fruit. When the fruit is cut open the flesh shows round, brown spots, mostly 4 to 8 mm. in diameter, which may also be observed in groups in the vascular bundles. The differences between cork disease and bitter pit [ibid., xv, p. 344] (which has been reported as occurring in Finland since 1910) are indicated. From 43 reports received at the Tikkurila Agricultural Experiment Station from 1933 to 1935 it appears that cork disease is prevalent in a more or less severe form in all the apple-growing districts of the country as far north as lat. 63°. Among the varieties attacked are Charlomovsky, Canella, Säfstaholm, Antonovka, White Nalif, Åkerö, Alexander, Charlottenthal, and Sugarmiron.

ASKEW (H. O.), CHITTENDEN (E.), & STANTON (D. J.). **'Internal cork' of Apples, Nelson, New Zealand.**—*N.Z. J. Sci. Tech.*, xvii, 4, pp. 595–599, 1936.

Determinations of soil moisture and physical properties conducted on two orchard areas in the Nelson district of New Zealand showed no direct connexion between 'internal cork' of apples [cf. preceding abstract] and a particularly low moisture content. Similarly, no positive correlation could be traced between the disease in Jonathan and Dunn's Favourite and a low moisture content of the fruit. While these data contradict the theory of water deficiency as the primary cause of corkiness, they do not preclude the probability (which is, in fact, supported by protracted observations at the Cawthron Institute) that the trouble may be accentuated by dryness of the soil.

GOIDÀNICH (G.). **Malattia del pero prodotta da un basidiomicete.** [A Pear disease caused by a Basidiomycete.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 4, pp. 501–532, 13 figs., 1935. [Received April, 1936.]

An account is given of the author's study of a dying-off of pear trees in different parts of Italy, caused by a fungus of which some of the characters resembled those of *Stereum purpureum* [*R.A.M.*, xiv, p. 772], but whose systematic position could not be definitely determined in the absence of fructifications. No silvering of the foliage or

other external symptoms were apparent, but internally the wood was discoloured. In the thicker branches and trunk the central zone of chestnut colour was surrounded by a darker area in contact with the healthy part of the wood. At the base of the trunk the affected tissues were almost black. Mycelium was abundantly present in the diseased tissues and was characterized by the frequent occurrence of clamp-connexions. The fungus attacks only weakened or dead cells, liberating a substance (probably an enzyme) which causes through the oxidation of the tannin the precipitation of the cytoplasm. Infection takes place at points where the host tissues are dead or weakened, especially near the graft union.

WILLISON (R. S.). **Peach canker investigations. II. Infection studies.**—*Canad. J. Res.*, xiv, 1, pp. 27–44, 3 pl., 3 graphs, 1936.

In further investigations into peach canker in Ontario, a comparative study of *Valsa leucostoma* and *V. cincta* [*R.A.M.*, xv, p. 162], isolated more or less consistently from cankers of various ages and die-back twigs showed that in culture on potato dextrose agar and Leonian's malt agar the former was hair-brown, with rostrate, usually dark pycnidia 1 mm. or less in diameter, which exuded cirri when mature, while the latter was whitish to olive-buff, sometimes black in the substratum, with white, felty pycnidia 1 to 3 mm. in diameter rarely if ever exuding cirri, though usually full of viable spores. On the host the stroma of *V. leucostoma* was compact, contained no host cells, and was delimited beneath by a black zone of carbonized fungal and host cells; the ascospores measured 10 to 17 by 2 to 4·5 μ. The stroma of *V. cincta* on the host was loose, contained host cells, and was delimited from the host cortex by a thin, black, sometimes only marginal line; the ascospores measured 14 to 28 by 4 to 7 μ. In both species the pycnospores ranged from 5 to 10 by 1 to 2 μ.

Artificial infection experiments, a preliminary account of which has already been noticed [loc. cit.], showed that *V. cincta* was a virulent wound parasite able to infect freshly made wounds during the late autumn, winter, and spring, and to give rise to perennial cankers. *V. leucostoma* [ibid., xv, p. 283], was found to be practically innocuous.

DÉFAGO (G.). **Sur quelques Valsées von Höhnel parasites des arbres à noyau dépérissants.** [On certain Valseae von Höhnel parasitic on dying-off stone fruit trees.]—*Thesis*, École Polytechnique Fédérale Zurich, viii+111 pp., 4 pl., 10 figs., 4 graphs, 1935.

This is a comprehensive and fully tabulated report of the author's investigations in Switzerland and south France to determine the part played by the Valsaceae in the causation of the very serious dying-off of stone fruit trees, especially the apricot. He considers that the constant presence of an entostroma and of a conceptacle separating the fructification from the underlying host tissue of substratum in *Valsa leucostoma* (which, in the regions studied, is chiefly prevalent on cherries and peaches), *V. cincta* [see preceding abstract] (chiefly on apricots, peaches, and plums), and *V. nivea* (which in nature was only seen on *Populus nigra* but was experimentally shown to be able to attack wounded apricot wood) is sufficiently significant to warrant the separation

of these species into the genus *Leucostoma*; he therefore accepts the names *L. persoonii* (Nit.) Togashi [*R.A.M.*, xi, p. 60, also cf. xv, p. 162] and *L. cincta* (Fr.) v. Höhn. for the first two, respectively, and suggests *L. nivea* for the third. Only two other members of the family were found on *Prunus* spp. in France and Switzerland, namely, *V. ambiens* and *V. microstoma*, the latter of which has also been recorded from Italy.

Morphological and biological studies [considerable details of which are given] showed that the above-named three *Leucostoma* species are distinct and well-defined morphological entities; the mature pycnidia are rather easy to confuse with each other but in earlier stages of growth those of *L. persoonii* are black, with dark red cirri; those of *L. cincta* are brown with amber-pink cirri, and those of *L. nivea* are much more rounded and smaller than the pycnidia of the other two. *V. ambiens* had pycnidia with an emergent, black ostiole, and yellowish-white cirri. The three *L.* spp. also differ significantly from each other in the measurements of their perithecia, asci, and ascospores, as well as in the nature and colour of their growth on artificial media. *L. persoonii* was shown to consist of nine biologic forms, differing in morphological details and in their pathogenicity; the forms are not, however, specific to certain species of *Prunus*. The extremes of these nine forms agree closely with certain strains of *L. nivea*, indicating the possibility that future work may show that *L. persoonii* and *L. nivea* are in reality the same species.

Artificial inoculation through injured bark of 39 species of *Prunus* with the *persicae* form of *L. persoonii* and two forms (Charrat I and Chippis) of *L. cincta*, showed that all, except *P. graeca* and *P. sieboldii* were susceptible to a greater or lesser degree. The fungi were capable of entrance only through wounded surfaces. The damage done by the organisms to stone fruit trees depends to a large extent on the virulence of the individual strains of the fungi and also on the health and vigour of the host, as determined by soil and weather conditions, the latter being the chief predisposing factors. The control measures very briefly indicated comprise the careful handling of the trees to avoid unnecessary wounding, the dressing of all pruning wounds with antiseptics, and a thorough sanitation of the fruit groves.

Blodgett (E. C.). **The anthracnose of Currant and Gooseberry caused by Pseudopeziza ribis.**—*Phytopathology*, xxvi, 2, pp. 115–152, 3 pl., 6 graphs, 1936.

This is an expanded account of the writer's studies on the physiology and pathogenicity of a number of strains of *Pseudopeziza ribis*, the agent of currant and gooseberry anthracnose, from Wisconsin, Oregon, Canada, and Holland, a preliminary note on which has already appeared [*R.A.M.*, xiv, p. 377].

The appressoria of the fungus were frequently found to play a part in the direct penetration of the cuticle and epidermal cell walls of the leaves. All the foliar tissues were disorganized and killed by the inter- and intracellular development of the organism. It was ascertained that primary spring infections are initiated by ascospores, by conidia produced in the spring, and probably also by overwintered conidia. Plants

inoculated on the lower leaf surface were more heavily infected than those inoculated on the upper, and plants held at higher temperatures prior to inoculation than those held at lower. Infection by conidia occurred at favourable temperatures (10° to 28° C.) with a moist incubation period of 12 hours or more.

Under the environmental conditions prevailing at Sturgeon Bay, Wisconsin, anthracnose is preventable by four applications of 3–4–50 Bordeaux mixture (*a*) just before the plants bloom, (*b*) immediately after fruit set, (*c*) three weeks later, and (*d*) just after harvest, while joint control of this disease and powdery mildew of gooseberries (*Sphaerotheca mors-uvae*) was secured by the substitution of lime-sulphur (1 in 40) for Bordeaux in the first two treatments.

WOLF (F. A.). **A correction.**—*Mycologia*, xxviii, 1, p. 85, 1936.

As the publication of the name *Sphaerella* (*Mycosphaerella*) *dubia* L. E. Miles (*Trans. Ill. Acad. Sci.*, x, p. 250, 1917) antedates the publication of *Mycosphaerella dubia* Wolf [*R.A.M.*, xiv, p. 775], it becomes necessary to assign another name to the perfect stage of *Cercospora rubi*, and the name *M. confusa* is proposed.

HILDEBRAND (A. A.) & KOCH (L. W.). **A microscopical study of infection of the roots of Strawberry and Tobacco seedlings by micro-organisms of the soil.**—*Canad. J. Res.*, xiv, 1, pp. 11–26, 3 pl., 2 graphs, 1936.

In this study strawberry and tobacco seedlings growing either in seed-bed muck soil heavily infested with *Thielaviopsis basicola* [*R.A.M.*, xv, p. 263] and other organisms pathogenic to tobacco, in soil from a commercial strawberry plantation where severe, typical strawberry root rot had occurred, or in a greenhouse compost soil, were examined microscopically daily, commencing a few hours after germination and continuing throughout a period of four weeks.

Organisms observed within the root tissues of both hosts included the Phycomycetous mycorrhizal fungus [ibid., xv, p. 178], *T. basicola* (noted in plants grown in muck soil only), *Rhizoctonia* [*Corticium*] *solani* and the orchid *Rhizoctonia* [*R. repens*: loc. cit.], several forms of *Pythium*, *Asterocystis* [ibid., xiii, p. 785], certain unidentified fungi, a minute alga, and nematodes. Organisms observed on the root surfaces included representatives of the genera *Ramularia*, *Fusarium*, *Helminthosporium*, *Sphaeropsis*, and *Cephalothecium*. The sequence of appearance, percentage occurrence, and parasitic capabilities of certain of the organisms varied in roots grown in different soils.

Initial infection by the Phycomycetous mycorrhizal fungus was noted in the tobacco and strawberry seedlings grown in muck soil 6 and 5 days, respectively, after germination; in the root rot soil after 13 and 5 days, respectively, while in compost infection of strawberry seedlings occurred 7 days after germination. In strawberry but not in tobacco seedlings the tissues resisted infection by the endophyte in the regions of the root tip and the root-stem transition, while in the intermediate region heavy infection by the endophyte usually occurred in both hosts. Besides minor differences the strawberry endophyte showed a sparsely septate mycelium with short papilla-like protuberances, vesicles more or less oval, and only rarely caused necrosis, whereas the mycelium of

the tobacco fungus was frequently septate, without protuberances, the vesicles were spheroidal, intracellular vesicles were more numerous, and considerable necrosis was present. These observations are considered to show that the so-called Phycomycetous mycorrhizal fungus consists of morphologically distinct strains.

Individual cortical cells of both hosts at or near ground-level frequently contained the coiled filaments of a blue-green alga. Necrosis was not correlated with the presence of this organism alone, but for the present it must be regarded as a possible factor in the root-rot complex.

From these results and from observations made on other hosts, the authors conclude that a root rot as it occurs in nature is extremely complex, even where a primary causal agent is recognized, and that fungi belonging to a comparatively few groups or genera are 'common factors' in root-rot complexes of different hosts.

ALCOCK (MRS. N. L.) & HOWELLS (D. V.). **The Phytophthora disease of Strawberry.**—*Sci. Hort.* [formerly *H.E.A. Yearb.*], iv, pp. 52–58, 1936.

In the first part of this paper, by Mrs. Alcock, a general review is given of the results of the investigation of the strawberry red core disease (*Phytophthora* sp.) [allied to *P. cinnamomi*: *R.A.M.*, xiii, p. 784]. Though resisting all attempts to induce germination the evidence available suggests that the oospores give rise to mycelium which invades the roots, the tips becoming packed with hyphae growing towards the root base. Infected roots die off quickly and fresh rings of roots are produced above the diseased ones, only to be infected in turn. Oospores are formed in great numbers, and the fungus has been found to remain alive in infected soil for at least eight years. Seven years' experiments in treating badly infected soil gave no really satisfactory result, but certain strains of one variety were found to show resistance and are being grown for further study.

In the second part, Howells states that while spread is generally from infected plants there is evidence that it may arise from boots, implements, and birds. The direction it takes is primarily governed by the most intimate direction of plant contact, spread along rows and beds being very striking.

MAGEE (C. J.). **Cercospora leaf spot of Bananas.**—*Agric. Gaz. N.S.W.*, xlvii, 1, pp. 30–32, 2 figs., 1936.

During the past two or three years banana leaf spot (*Cercospora musae*) [*R.A.M.*, xv, p. 164], hitherto a widespread but unimportant disease locally, has occurred in a severe form in several districts of New South Wales as a result of unsatisfactory land being brought into cultivation. The disease is prominent in the cool, wet season (April to September) but generally causes minor losses, only the older leaves of the more mature plants usually being affected. Where severe infection has occurred considerable defoliation of hundreds of stools has taken place in individual plantations, the bunches left on defoliated stems failing to mature. The checking of the disease in summer is due to the higher temperatures and lower humidities then prevalent and the greater vigour of the plants. Infection is most destructive in plantations

with southerly or south-westerly aspects or altitudes of 1,000 ft. or over, or in those on infertile or over-cropped soils.

Fungicidal treatment both in New South Wales and Queensland having failed to show promising results [ibid., xii, p. 456; xiii, p. 112] the proper choice of the plantation site is of paramount importance if losses are to be avoided. After the spring flush of growth has commenced all dead and damaged leaves should be removed and burned and the vigour of the plants should be maintained by green manuring, fertilizer applications, and weed control.

JACQUES-FÉLIX (H.). **La maladie du 'bout noir' des Bananes de Guinée française.** [The 'black tip' disease of Bananas in French Guinea.] —*Rev. Bot. appl.*, xvi, 173, pp. 55–56, 1936.

Helminthosporium torulosum [*R.A.M.*, xv, p. 284] has been observed in French Guinea causing the typical symptoms of 'black tip' in bananas, which are invaded by way of the floral organs or through apical wounds inflicted by their careless or untimely removal. Under local conditions the fungus is sometimes found infecting the stalk through injuries due to excessive sunlight.

MALLAMAIRE (A.). **Les parasites et les maladies du Bananier en Guinée française.** [The parasites and diseases of the Banana in French Guinea.]—*Rev. Bot. appl.*, xvi, 173, pp. 49–54, 1936.

Bananas in French Guinea are stated not to suffer unduly from pests and diseases in comparison with other tropical countries, even the serious rot caused by *Marasmius stenophyllus* [*R.A.M.*, xiv, p. 154; cf. also ibid., xv, p. 165] being controllable by plant sanitation and the application to the infected stems of a copper-lime mixture (3 : 1·5 per cent.). Rotting of the tips of the fruits is associated with a *Fusarium*, which is probably secondary to *Helminthosporium torulosum* [see preceding abstract]. A black, soft rot, starting from the cut end of the stalk and extending to the peduncles and even to the fruits, is caused by wound parasites, e.g., *Gloeosporium musarum* [loc. cit.], *Lasiodiplodia* [*Botryodiplodia*] *theobromae* [ibid., xiii, p. 174], *Verticillium* and *Fusarium* spp., and *Thielaviopsis* [*Ceratostomella*] *paradoxa* [ibid., xv, p. 104]. Recommendations similar to those already made for the control of these rots [ibid., xi, p. 189] are given.

CARTER (W.). **The symbionts of Pseudococcus brevipes in relation to a phytotoxic secretion of the insect.**—*Phytopathology*, xxvi, 2, pp. 176–183, 1 fig., 1 diag., 1936.

When colonies of the mealy bug (*Pseudococcus brevipes*) responsible for the green spotting of pineapple leaves in Hawaii [*R.A.M.*, xiv, p. 580] were transferred from pineapple to *Panicum barbinode* their capacity for green spotting was lost and could not be restored by recultivation on the original host. At the same time the rod-like symbiont normally occupying the mycetome of the insect disappeared and was replaced by an extremely minute coccus form visible only under high magnification. The inference from these observations is that the symbiont is pleomorphic and undergoes degeneration as a sequel to a radical change of nutrition.

FRENCH (O. C.). **Rate of wear of spray-gun disks.**—*Agric. Engng, St Joseph, Mich.*, xvii, 2, pp. 67, 88, 1 graph, 1936.

Technical details are given of tests on the resistance of six different kinds of spray-gun disks supplied by the J. Bean Mfg Co. to fit the Bean Fig. 789 gun [*R.A.M.*, xi, p. 196] to abrasion, determined by forcing Bordeaux (5–5–50) mixture through them at a pressure of 450 lb. per sq. in. for a maximum period of 39½ hours. It was found that the rust-proof stellite disk offered considerably greater resistance to wear than the other types (phosphorus bronze, brass, and three kinds of steel) tested, and if clean water were procurable would almost retain its original capacity for many hours of use, sandy water being injurious, however, even to a metal of this hardness. In order to exclude sand from the water it is suggested that the elevated water storage tanks used to fill the spray tanks should also serve as sediment-collectors, the water being drawn out about 12 in. from the bottom, where most of the sand or fine grit will be found to have settled.

BERAN (F.). **Pflanzenschutzmittel, I. Nachtrag.** [Plant protectives, Appendix I.]—*Neuheiten PflSch.*, xxix, 1, pp. 10–12, 1936.

This appendix to the list of plant protectives officially recommended by the Austrian Institute for Plant Protection [*R.A.M.*, xiv, p. 518] includes eight fungicides, the purposes and modes of application of which are indicated.

RIEMANN (F.). **Vom Kampf gegen den Vermehrungspilz.** [On the campaign against the propagation fungus.]—*Blumen- u. PflBau ver. Gartenwelt*, xl, 6, p. 62, 1936.

Some cultural measures are recommended against the 'propagation fungus' (*Moniliopsis aderholdi*) in German greenhouses and seed-beds [*R.A.M.*, xii, pp. 97, 448], including the use of burnt sandy soil with a small admixture of carbonate of lime, the substitution of cement-concrete for wooden frames, and careful adjustment of the temperature and humidity relations.

WILLAUME (F.). **Action stimulante de certains traitements insecticides et fongicides sur les plantes cultivées.** [The stimulating action of certain insecticidal and fungicidal treatments on cultivated plants.] —*Rev. Path. vég.*, xxiii, 1, pp. 28–32, 1936.

The author's field and laboratory studies are stated to have shown that stimulation of fruit trees by carbolineum, Bordeaux mixture, and lime-sulphur sprays or by iron sulphate [*R.A.M.*, xv, p. 159] applied as a spray or injected into the trunk against chloroses is qualitatively similar and due to the same initial cause, i.e., the photo-sensitization or photo-catalysis set up. The treatments given contain or produce in the plant more or less fluorescent photo-sensitizing bodies which when acted upon by certain luminous rays emit a different luminous radiation, and can transform the usually inactive radiations of the visible spectrum into active ones. The effect produced, if excessive, causes scorching, sometimes attributed to the effect of the sun [cf. ibid., xv, p. 36].

LOCKWOOD (L. B.). **Fungi from laboratory reagents.**—*Mycologia*, xxviii, 1, pp. 10–12, 1936.

Among the examples of fungal tolerance towards standard chemical reagents observed by the author in his laboratory the following may be mentioned. *Fusarium orthoceras* was isolated from a 0·5 per cent. solution of potassium acetate. A vigorous strain of *Aspergillus fumigatus* was isolated from a 30 per cent. potassium nitrate solution. *A. tamarii* was isolated from a saturated aqueous solution of dimethyl-dihydro-resorcinol.

DUFRÉNOY (J.). **Cellular immunity.**—*Amer. J. Bot.*, xxiii, 1, pp. 70–79, 6 figs., 1936.

In this paper the author describes and illustrates with examples the cytological changes that take place under the influence of an invading parasite or virus agent within the living cells of plants susceptible, moderately susceptible, or highly resistant to the respective pathogens. The results of the study indicate that in cases of extreme susceptibility and of most systemic diseases, the host-parasite adjustment is so delicate that the penetration of the pathogen, at least in the initial stages of infection, hardly interferes with the metabolism of the cell, while in a moderately susceptible host the process results in a mobilization of the cell reserves, and the cell itself reverts to the meristematic condition, resuming growth and sometimes eventually dividing. In highly resistant hosts, on the other hand, the cells are killed at the first attempt by the pathogen to enter them, and the vacuolar sap of the surrounding cells becomes very rich in phenolic compounds, which renders them a most uncongenial medium for the pathogen.

RENN (C. E.). **The wasting disease of Zostera marina. I. A phytological investigation of the diseased plant.**—*Biol. Bull. Wood's Hole*, lxx, 1, pp. 148–158, 6 figs., 1936.

The foliage of *Zostera marina* beds affected by the wasting disease [*R.A.M.*, xv, p. 39] in American and Canadian waters was observed by the writer during three years' investigations to consist of young, rapidly growing, green leaves, 8 to 12 cm. in length, from which the characteristic dark blotching and streaking may be absent; medium-sized leaves badly discoloured with brown or black spots; and wilted basal fragments of older leaves sloughed off shortly after the disintegration of the bulk of their green tissues. The spotting is usually confined to the epidermis but may arise in any green tissue, developing into extensive plaques or mosaics of scattered, darkened cells. The streaking associated with the serial infection of the larger, longitudinally disposed mesophyll cells is generally sharply delimited and its margins spread rapidly, from 3 to 5 cm. a day, or more during the period of maximum activity in the summer. The cuticle and cortex of the stem are often, but not always, irregularly pigmented with dark brown or black. After the defoliation of the plant the stem may persist and produce several new shoots each season for a year or two, at the end of which time the reserve food supplies become exhausted and the weakened stems are invaded by bacteria, fungi, and attendant saprophytes, while the true roots soon decompose in the mud.

The fusiform cells and interconnecting system of pseudopodia peculiar to *Labyrinthula* were first observed in stained sections of diseased leaves from the Nantucket region of Massachusetts in the spring of 1934 [ibid., xiii, p. 793]. The belated detection of the parasite was probably due to its unusual distribution in the infected material, well ahead of the visible symptoms, its slight refractility, and its erratic reactions to staining. The spindle-shaped cells measure 10 to 20 by 5 to 8 μ and are motile, gliding along the interconnecting pseudopodial web at rates exceeding 50 μ per minute; they may collect into thick cords or strands (pseudoplasmodia) which also perform progressive movements, though less swiftly than the individual spindles, while a resting stage, in the form of light brown, cyst-like, spherical bodies, 6 to 10 μ in diameter, surrounded by less dense, thick cuticles, was also observed in the older infected tissues.

No changes attributable to the direct attack of the parasite on the stems and roots were discernible, the damage induced by its action being reflected only in the destruction of the food-synthesizing mechanism of the plant.

The parasitic character of the *Labyrinthula* in *Z. marina* was demonstrated by the following method. Thirty-six hanging drop preparations were made, each consisting of tangential sections of living, healthy leaf held against the under side of the cover-glass by a droplet of Seitz-filtered sea water in which, at a distance of 1 mm. from the test tissue, were placed fragments of diseased leaf containing viable cells of the pathogen. Within 8 to 48 hours the migration of motile spindles or the extension of pseudoplasmodia from the diseased to the healthy material was evident in 30 out of the 36 preparations, the progress of disintegration in the latter being identical with that previously observed in sections of living, diseased leaves. Ten uninoculated control mounts remained in a healthy state under the experimental conditions. These results were amply substantiated by those of the extensive inoculation experiments carried out in selected beds near Wood's Hole in 1934–5 by fastening fragments of diseased leaves on to healthy plants, in which over 50 per cent. infection developed after two days' contact.

So far the *Labyrinthula* from *Z. marina* has failed to develop on any of the artificial media tested, but large numbers of spindles and pseudoplasmodial masses are obtainable by culturing fragments of infected leaf in sealed hanging drop mounts.

LANCEFIELD (S.). **Moulds and food spoilage. A few practical notes.**—*Food*, liii, 5, pp. 196–198, 3 figs., 1936.

The available information on the etiology and control of food spoilage by moulds (principally *Penicillium glaucum*, *Mucor mucedo*, *Aspergillus glaucus*, and *Oidium* [*Oospora*] *lactis*) [cf. *R.A.M.*, xv, p. 241] in Great Britain is summarized in popular terms. The majority of moulds succumb to 30 minutes' exposure to a temperature of 60° C., while as a rule the spores are destroyed in 10 minutes at about 65°. It is therefore comparatively simple to kill any mould growths in food materials subjected to cooking in the factory, but extreme care is necessary to prevent subsequent contamination by spores in the atmosphere. As a case in point is cited the spoilage of many tons of butter and other

dairy products in a milk-powder factory with a wooden-lined ceiling. All food-manufacturing premises should be regularly disinfected with 0·25 to 0·5 per cent. sodium hypochlorite and the utensils thoroughly washed in boiling water. Air filtration is stated to have become a routine practice in many factories, where it effectively prevents damage by moulds.

PRESTON (N. C.). **A simple method of preserving and mounting specimens of fungal lesions, etc. for demonstration.**—*Trans. Brit. mycol. Soc.*, xx, 2, p. 190, 1936.

The author describes a simple, rapid method for preserving specimens of fungal lesions on plants in a fresh condition. A 2 per cent. agar solution containing about 0·1 per cent. mercuric chloride is poured into Petri dishes and when it has cooled to near solidifying point the leaves or other material are plunged directly into it and held in position until the agar solidifies. Specimens so prepared are stated to keep for many months.

SMITH (K. M.). **Some aspects of the plant virus problem.**—*Sci. Progr. Twent. Cent., 1936*, 119, pp. 413–421, 2 pl., 1936.

This paper presents in a clear and readily intelligible form some of the more striking phenomena characteristic of virus diseases of economic and ornamental plants [see above, p. 444], and emphasizes both the scientific interest and the commercial importance of the problems arising out of these studies. Most of the work referred to has been noticed from time to time in this *Review*.

SMITH (K. M.). **Recent work on the plant viruses.**—*Curr. Sci.*, iv, 8, pp. 565–569, 1936.

The author divides this concise summary of recent advances in the study of plant viruses [see preceding abstract] into three sections, the first dealing with some important features of the relationship between the viruses and their insect vectors, the second with the behaviour of the infective principle within its host, and the third with the investigation of the viruses outside the host. In conclusion, a brief note is given on the antigenicity of plant viruses.

HATCH (A. B.). **The role of mycorrhizae in afforestation.**—*J. For.*, xxxiv, 1, pp. 22–29, 3 figs., 1936.

After discussing 16 failures in afforestation projects in widely separated regions of the world where the cause in each case is traced to the lack of a biological factor in the soil, the author describes an experimental study of the mycorrhizal factor in afforestation [cf. *R.A.M.*, xv, p. 308] in relation to prairie soils.

Twenty germinated seeds of white pine (*Pinus strobus*) were planted in August, 1934, in each of six containers filled with freshly collected soil from a treeless area near Wyoming, mixed with two-thirds coarse silica sand. By early November the seedlings in all the containers were small, yellow, unthrifty, and had gone into premature winter dormancy associated with low nutrient conditions. The seedlings in three containers were then inoculated with pure cultures of *Boletus luteus* [ibid.,

xii, p. 778], *Boletinus pictis* [ibid., xiii, p. 458], *Lactarius deliciosus* [ibid., xii, p. 778], *L. indigo*, and *Mycelium radicis nigrostrigosum* [ibid., xv, p. 308].

Between 1st April and the end of May following the new needles in the inoculated pots became dark green and elongated rapidly, whereas in the uninoculated pots the new needles were yellow and short. The plants were harvested between 27th May and 5th June. In one inoculated pot some 30 per cent. of all the short roots showed mycorrhiza, produced by *B. luteus*, except for a few dozen formed by *L. deliciosus*. In the second inoculated pot, in which *B. pictis* had been introduced, the mycelium had spread slowly, but 13 out of the 20 seedlings had up to 90 per cent. of their short roots infected. Seedlings in the third pot showed the short roots to be all dead, though many had developed mycorrhiza. Analyses of the seedlings in the first two inoculated pots gave 1·241 per cent. nitrogen, 0·1957 per cent. phosphorus, and 0·744 per cent. potassium compared with 0·849, 0·0735, and 0·425 per cent. for the controls, representing increases of 86, 234, and 75 per cent., respectively, in favour of the mycorrhiza plants. The great increase in the absorption of these constituents demonstrated conclusively that the white pine seedlings grown in the prairie soil did not obtain sufficient nutrients to support normal growth when mycorrhiza were absent.

These results further indicate that mycorrhizal fungi are lacking in the soil of American prairies, that in their absence the absorption of nutrients by trees is liable to be inadequate, and that mycorrhizal fungi constitute the specific biological factor necessary for tree survival in prairie regions. In starting new nurseries and afforestation projects in the American prairies, seeds only should be used, to exclude pathogens, and mycorrhizal fungi must be introduced artificially.

Dillon Weston (W. A. R.). **The sporulation of Helminthosporium avenae and Alternaria solani in artificial culture.**—*Trans. Brit. mycol. Soc.*, xx, 2, pp. 112–115, 1936.

In a further account of his studies on the sporulation of *Helminthosporium avenae* exposed to ultra-violet rays [*R.A.M.*, xii, p. 504] the author describes experiments showing that sporulation is induced by visible light of high intensity and not by ultra-violet light. A similar result was obtained in the case of *Alternaria solani*. In ordinary laboratory work it is thought that the light intensity is not sufficiently high to induce sporulation and the use of artificially illuminated incubators is suggested.

Fedotova (Mme T. I.). Биохимический метод определения степени паразитизма рода **Fusarium.** [A biochemical method for the determination of parasitism in the genus *Fusarium*.]—*Pl. Prot. Leningrad, 1935*, 1, pp. 115–118, 1935. [Received May, 1936.]

After a brief reference to the difficulties inherent in the determination of the pathogenicity of species of *Fusarium* found in association with plant diseases, as well as to the length of time required by the usual pathogenicity tests, the author gives a very concise outline of experiments designed to find a short laboratory method of establishing pathogenicity by correlating differences in biochemical properties with the

pathogenicity or non-pathogenicity of the species, a detailed report of which is left for the future. She found that in pure culture on glass wool in a standard solution (1 per cent. peptone, 2 per cent. glucose, 0·1 per cent. potassium dihydrogen phosphate, and 0·1 per cent. magnesium sulphate) the sharply parasitic species (*F. buharicum* [*R.A.M.*, xiii, p. 93], *F. lini*, and *F. graminearum*) accumulated from 3 to 5 mgm. amine nitrogen and 6 to 8 mgm. ammonia nitrogen [cf. ibid., xv, p. 388], while the purely saprophytic species (*F. falcatum* [*F. equiseti*] and *F. ossicolum* [*F. equiseti*]) accumulated 19 to 27 mgm. of the former and 35 to 52 mgm. of the latter, the difference being sufficiently significant to be of practical usefulness. Species intermediate in their pathogenicity (including *F. culmorum*, *F. vasinfectum*, *F. moniliforme* [*Gibberella moniliformis*] and *F. herbarum* [*F. avenaceum*]) accumulated intermediate amounts (11 to 19 and 9 to 28 mgm., respectively) of the two kinds of nitrogen. These results are admittedly preliminary, and subject to confirmation with other species of fungi, but a test carried out with the intermediately pathogenic *Verticillium dahliae* [ibid., xiii, p. 369] partially confirmed the validity of the method, since it was found that this fungus also accumulated only 8 mgm. of amine nitrogen and 18 mgm. of ammonia nitrogen per unit of weight.

BERKNER (F.) & HECKER (G.). **Die Nachwirkung von verschiedenen Kalidüngern und Pflanzzeiten des Vorjahres auf den Pflanzgutwert von Kartoffeln.** [The after-effect of various potash manures and planting times in the previous year on the value of Potatoes for seed.]—*Landw. Jb.*, lxxxii, 1, pp. 125–139, 1935.

A tabulated account is given of the writers' observations at Breslau on the influence of various potash compounds and of the planting dates in 1933 on the health and yield of the 1934 potato crop. As in the previous series of observations [*R.A.M.*, xv, p. 111], the progeny of the late (July) plantings was in all respects the most satisfactory, while the deleterious effects of potassium chloride on the constitution of the plants were again apparent. The soundest stands in respect of degeneration were those receiving no potash in 1933.

O'BRIEN (D. G.). **Potato growing and research in Scotland.**—*Sci. Hort.* [formerly *H.E.A. Yearb.*], iv, pp. 30–37, 1936.

In this paper it is stated that under the potato certification scheme of the Scottish Department of Agriculture the first official inspection of the growing crops [*R.A.M.*, x, p. 542] is generally made towards the end of June or early in July, the second in August, and the third in September. Varieties must be over 99·5 per cent. pure to obtain a TS certificate for an immune variety or an NI certificate for a non-immune variety. At the same time they must be comparatively free from virus diseases, and if in addition to being pure they are also up to the required standard in health a further certificate TS(H) or NI(H) is granted. A special stock seed certificate SS is given to especially pure and healthy varieties. In building up stocks for seed the usual practice is to select one or two very healthy plants having the varietal characteristics well developed. The progeny of such plants is grown apart, and any plant

suspected of virus infection is uprooted before it has time to infect others. During an official inspection a stock seed certificate is not granted if it is evident that over 10 per cent. of the plants have been removed by the farmer before the inspection.

Potato blight (*Phytophthora infestans*) in Scotland [ibid., iv, p. 437; vi, p. 747] is less important than it is in England, since as a rule it does not appear until August, and in many years until September. Very little spraying against blight is carried out, as in most years it would not pay. When spraying is effected, it is mainly done by those growing varieties for seed, and where the stocks are of exceptional value. The practice of burning down the haulms with 3 or 4 per cent. copper sulphate solution is becoming common [ibid., xiv, p. 527; cf. also xv, p. 45].

GIGANTE (R.). **Secondo contributo alla conoscenza della necrosi del cuore dei tuberi di Patata.** [A second contribution to the knowledge of heart necrosis of Potato tubers.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 4, pp. 555–560, 1 fig., 1935. [Received April, 1936.]

When potatoes of the Böhms Allerfrüheste Gelbe variety (*a*) healthy, (*b*) affected with heart necrosis [*R.A.M.*, xiii, p. 722], and (*c*) apparently healthy progeny of plants affected with this disease were planted in three plots in Italy the plants in plots (*b*) and (*c*) grew as well as the healthy controls, but the tubers showed 30 and 29 per cent. heart necrosis, respectively, while the yields from all three plots were approximately equal both in the number and size of the tubers produced. The disease was not transmitted, however, by grafting affected tubers on healthy tubers of the Noordeling variety and further experiments are required to determine whether the condition is attributable to a virus or not.

GIGANTE (R.). **Prime ricerche sul comportamento di alcune varietà di Patata italiane di fronte di virus.** [Preliminary researches on the behaviour of certain Italian Potato varieties towards viruses.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 4, pp. 533–547, 8 figs., 1935. [Received April, 1936.]

To ascertain whether the Italian potato varieties Basilicata bianca, Bianca di Como, Gialla del Fucino, and Riccia di Napoli are carriers of virus diseases the author made inoculations with their sap and by means of stem and tuber grafts as well as by *Myzus persicae* into Noordeling potato plants, White Burley and Samsun tobacco, tomatoes, *Nicotiana glutinosa*, and *Datura stramonium*, but no signs of disease appeared in any of the plants used as indicators.

When the same four potato varieties were inoculated by tuber grafting with the potato virus X from Magdeburger Blaue and the Y virus [*R.A.M.*, xv, p. 391] from Zeeuwsche Blaue potatoes the X virus affected only the Basilicata bianca and Riccia di Napoli varieties, producing 25 and 80 per cent. dwarfing, respectively, with complete loss of yield, while the Y virus affected only the Bianca di Como and Gialla del Fucino varieties, producing 33 and 60 per cent. dwarfing, respectively, with complete loss of yield. Neither virus produced any symptoms other than the dwarfing on any of the varieties.

Bates (G. H.) & Dillon Weston (W. A. R.). **The dying of the tips of Potato sprouts during 'chitting'.**—*Sci. Hort.* [formerly *H.E.A. Yearb.*], iv, pp. 141–142, 1936.

A widely prevalent trouble with sprouted potato 'seed' when the tubers are set up in trays is the blackening and death of the tip of the sprouts. No pathogenic fungus was found in affected material, but it was noted that the trouble never occurred on sprouts 'chitted' in a good light, though seed chitted in darkness or semi-light was thin, etiolated, sappy, and easily damaged. When the shoots of potatoes chitted in darkness or poor light were slightly bruised experimentally darkening and browning of the tips generally ensued within twelve hours. If, however, the bruised shoots were kept in a bright light the discoloration gradually disappeared. When shoots grown in high light intensities were bruised accidentally or deliberately no marked blackening of the tips resulted.

Eddins (A. H.). **Bacterial wilt of Potatoes, Tomatoes, and Eggplant controlled with sulphur and limestone.**—Abs. in *Phytopathology*, xxvi, 2, p. 91, 1936.

Bacterial wilt of potatoes, tomatoes, and eggplants (*Bacterium solanacearum*) was successfully combated in Florida in 1934–5 by the application to the soil of (*a*) 800 lb. per acre of freshly inoculated sulphur and (*b*) 3,000 lb. of dolomitic limestone, the former treatment (given in June) reducing the reaction from P_H 5 to just below 4 and the latter (in November) restoring it to its original degree of alkalinity and inducing normal growth. The percentages of infection on Spaulding Rose potato tubers, tomatoes, and eggplants on the treated plots were 0·8, 17·9, and 5·9 per cent., respectively, the corresponding figures for the controls being 70·4, 98·8, and 70·6 per cent., respectively. The treatment resulted in an increased yield of potatoes of 23·1 bush. per acre.

Folsom (D.) & Bonde (R.). **List of distinct Potato viruses.**—*Amer. Potato J.*, xiii, 1, pp. 14–16, 1936.

The following 26 potato viruses are differentiated mainly on the basis of the symptoms induced in the Green Mountain variety: (1) tobacco mottle and (or) ring spot of J. Johnson, synonyms of which are potato mottle and potato ring spot of Koch and Johnson [*R.A.M.*, xiv, p. 523], seedling streak, latent virus, healthy potato virus, X virus [ibid., xv, p. 172], Fernow's B virus [ibid., v, p. 314], simple mosaic, and acro- or top necrosis [ibid., xv, p. 310]; (2) tobacco ring spot of Virginia [ibid., xi, p. 132 *et passim*]; (3) tobacco mosaic; (4) cucumber mosaic; (5) Green Mountain rugose mosaic caused by pure rugose mosaic and latent (synonyms, veinbanding and mottle or ring spot in combination); (6) Green Mountain mild mosaic (pure mild mosaic and latent); (7) Green Mountain crinkle mosaic (probably pure crinkle mosaic and latent); (8) Green Mountain leaf-rolling mosaic (probably pure leaf-rolling mosaic and latent) [ibid., xv, p. 246]; (9) Green Mountain interveinal mosaic (probably pure interveinal mosaic and latent); (10) aucuba mosaic [ibid., xiv, p. 385]; (11) Porter's calico [ibid., i, p. 448 *et passim*]; (12) Green Mountain streak (possibly Smith's Y [ibid., xiv, p. 327] and

latent); (13) streak of Koch and Johnson [ibid., xiv, p. 524]; (14) tomato spotted wilt; (15) Verplancke's 'bigarrure' [ibid., xiv, p. 251]; (16) leaf roll; (17) apical leaf roll of Schultz and Bonde [ibid., viii, p. 395] (Folsom's yellow top probably synonymous); (18) witches' broom (wilding) [ibid., xiv, p. 784]; (19) yellow dwarf [ibid., xv, p. 249]; (20) aster yellows [ibid., xiv, p. 312]; (21) beet curly top; (22) spindle tuber; (23) unmottled curly dwarf [ibid., xiv, p. 784]; (24) transmissible low-growing habit of M'Intosh; (25) pseudo-net necrosis; and (26) internal spotting in tubers.

Green Mountain mottled curly dwarf is stated to be a mixture of leaf-rolling mosaic and spindle tuber. It is thought that tobacco spot necrosis, crinkle, paracrinkle, Up-to-Date streak, acropetal necrosis, virus A of Ireland, and B, C, D, and Z of England may be identical with, or mixtures of, some of the foregoing, while marginal leaf roll and giant hill [ibid., xv, p. 247] may not be due to viruses at all.

SCHULTZ (E. S.) & RALEIGH (W. P.). **Acquired resistance of Potato to latent mosaic.**—Abs. in *Phytopathology*, xxvi, 2, p. 107, 1936.

Healthy Katahdin potato tubers and shoots, grafted on latent mosaic [see preceding abstract] Green Mountain, develop foliar and tuber necrosis. Tuber progeny of the necrotic shoots give rise to plants manifesting more or less acute necrosis, while mottled Katahdin shoots grafted on latent mosaic Green Mountain and healthy Katahdin on mottled Katahdin show mottling and mild necrosis. From these observations it would appear that mottled Katahdin has acquired resistance to latent mosaic, the virus of which harboured by this variety may further be an attenuated or weak member of the group [see next abstract].

SCHULTZ (E. S.) & RALEIGH (W. P.). **Reaction of a Green Mountain Potato seedling to composite infections of mild and crinkle mosaic and different types of latent mosaic virus.**—*Phytopathology*, xxvi, 2, p. 107, 1936.

The latent mosaic potato virus has been shown by means of inoculations on *Datura stramonium* to fall into four types, viz., faint [see preceding abstract], medium, severe, and virulent [*R.A.M.*, xiv, p. 261]. On Green Mountain inoculation with a complex of mild mosaic and severe latent causes distinct mottling and ruffling, while mild mosaic and faint latent induces the former symptom only, and mild mosaic alone results in slightly paler green and rugose foliage. These data indicate that different groups of viruses are responsible for mild and latent mosaic and that distinct pathological manifestations arise from inoculation with virus complexes of various types.

LAWRENCE (W. J. C.) & NEWELL (J.). **Seedling growth in partially sterilised soil.**—*Sci. Hort.* [formerly *H.E.A. Yearb.*], iv, pp. 165–77, 7 figs., 1936.

As a result mainly of what appeared to be a severe fungal or bacterial infestation of the soil in which *Primula sinensis* was being grown, a system of soil sterilization (used in the usual sense of partial sterilization) and also sterilization of all vessels and appliances used in the rais-

ing and growing of pot plants under glass was introduced at the John Innes Horticultural Institution, Merton, London, where it has been in operation for over a year. The results have shown the practice of soil sterilization to be highly economical [*R.A.M.*, xi, p. 471], quite apart from the better growth obtained.

The soil is sterilized by steam at 212° F. for 30 minutes. In experiments with different composts, the addition of mortar rubble, slaked lime, or pure chalk exerted a deleterious effect on the heated compost resulting in a check to seedling growth. The results of experiments in which the compost ingredients, loam, moss-peat, and sand, were sterilized separately and in all possible combinations, showed that an interaction occurred between all three constituents, the best plants being obtained when the ingredients were sterilized separately. While some plants were very sensitive to the reaction of the ingredients, others hardly responded to it.

To ascertain whether the addition of fertilizers to the sterilized soil would rectify the poor growth still observed in some cases a number of tests were carried out which showed that the addition of nitrogen slightly improved growth, while potash made no difference or had a retarding effect; the addition of phosphate, however, was immensely beneficial. The effect of chalk (1 oz. per bush.) was variable, but growth was particularly good with chalk and superphosphate added. All seven loams used were found to be deficient in available phosphate, the addition of which is necessary to rectify this deficiency and to balance the changed soil conditions brought about by sterilizing.

Clarté (R.). **Trois maladies particulières du sol et leurs répercussions sur certaines plantes aux Pays-Bas.** [Three soil diseases and their repercussions on certain plants in the Netherlands.]—*J. Agric. prat., Paris*, N.S., c, 9, pp. 178–180, 4 figs., 1936.

This is a summary in popular terms of three soil diseases affecting oats and other crops in Holland, viz., 'Veenkolonial' [grey speck: *R.A.M.*, xv, p. 356], Hooghalen [soil acidity: ibid., xi, p. 471], and reclamation [ibid., xv, p. 355], the last-named having also been observed in Périgord (France), but not recognized as such at the time.

Linnemann (Germaine). **Beitrag zu einer Flora der Mucorineae Marburgs.** [Contribution to a flora of the Mucorineae of Marburg.]—*Flora, Jena*, N.F., xxx, 2, pp. 176–217, 25 figs., 1936.

The writer isolated from some 85 samples of soil from the Marburg district of Germany, as well as from miscellaneous organic substrata, some 60 species of Mucorineae [*R.A.M.*, xiv, p. 655] divided into 14 genera, *Mucor* being represented by 26 species, *Absidia* by 6, *Mortierella* by 12 (including *M. isabellina*) [ibid., xii, p. 242], and *Rhizopus* by 4 species, respectively; 12 species [German diagnoses of which are given] are believed to be new to science. Keys are furnished for the determination of species of the three last-named genera.

Salmon (E. S.). **Diseases of Hops.**—*J. Inst. Brew.*, N.S., xxxii, 6, pp. 235–237, 1935.

Notes are given on the mode of infection of hops by downy mildew

(*Pseudoperonospora humuli*) [*R.A.M.*, xiv, p. 792] and on the measures devised at the South-Eastern Agricultural College, Wye, Kent, for the control of the disease. Other fungal diseases of the crop enumerated are mould (*Sphaerotheca humuli*), canker (*Fusarium* sp.), wilt (*Verticillium albo-atrum*) [ibid., xiii, p. 354], leaf spot (*Cercospora cantuariensis*) [ibid., vii, p. 599], die-back (*Phoma* sp.), grey and black moulds (*Botrytis cinerea* and *Cladosporium* sp., respectively), and hop drop (*Macrosporium* sp.). Observations are further made on three virus diseases, viz., nettlehead [ibid., xi, pp. 539, 744], mosaic [ibid., xiv, p. 423], and chlorotic disease [ibid., xv, p. 257], and on four of obscure origin, namely, split leaf [ibid., xiv, p. 423], split leaf mottle, small hop [ibid., xii, p. 122], and crown gall (in the swellings associated with which there is stated to be no evidence of infection by *Bacterium tumefaciens*).

PARHAM (B. E. V.). **Wilt disease of 'Yangona'.**—*Agric. J. Fiji*, viii, 1, pp. 2–8, 1935. [Received May, 1936.]

The wilt of yangona (*Macropiper* [*Piper*] *methysticum*), previously reported from Fiji [*R.A.M.*, xv, p. 137] as probably caused by a bacterium in association with *Fusarium* and a *Neocosmospora*, is stated to progress frequently from higher to lower ground; one side of a gully may be completely devastated, while the other remains unaffected, the line of demarcation being the watercourse at the bottom. In young plantations incidence is frequently dispersed and sporadic, suggesting that infection is carried in the planting setts. The areas first and most severely affected in Suva-Rewa were those planted with setts from Lami, where the disease was first observed. So far it does not appear to have spread beyond the Suva-Rewa and Lami areas. The disease may still be controlled by destroying affected plants before abandoning infected areas, by roguing diseased plants from all plantations, and by selecting planting material from healthy stands. For some time at least the planting of large areas should be discouraged or prohibited except under supervision.

ROSENFELD (A. H.). **Sugar Cane breeding in Egypt. A progress report.**—*Bull. Minist. Agric. Egypt* 161, 20 pp., 3 pl. (1 col.), 1935.

After a brief botanical account of the genus *Saccharum*, the author summarizes the progress attained in the breeding in Egypt of new varieties of sugar-cane, in the attempt to obtain types superior to P.O.J. 105 which still remains by far the best general-purpose variety in the country, especially owing to its remarkable resistance to streak [*R.A.M.*, xiv, p. 56] (which is stated to be very prevalent on P.O.J. 2878 in Egypt), mosaic, and leaf spot [*Helminthosporium sacchari*]. Most of the work is still in the preliminary stage, but a few of the descendants of the crosses tested (all of which were made in other countries, because no fertile sugar-cane seed can be produced in Egypt owing to its subtropical climate) appear to be promising. Special mention is made in this respect of the progeny of the United States self-pollinated 666 designated Egypt 8, which, while readily taking streak, is apparently quite tolerant of this disease, as well as of the progeny of a cross between P.O.J. 2878 and Uba Marot, eight lines of which (E–9 to E–16, inclusive)

combine high commercial and technical qualities with high disease resistance.

Dey (P. K.). **Diseases of Sugar-Cane.**—*J. Sci. Tech., India*, i, 2, pp. 23–30, 1935.

Some interesting facts are mentioned in connexion with this semi-popular account of sugar-cane diseases occurring in the United Provinces, India (where 16 of the 39 recorded on the crop up to 1932 are stated to be found). The most important is mosaic [*R.A.M.*, xv, p. 398], followed by red rot (*Colletotrichum falcatum*) [ibid., xiii, p. 803; xv, p. 116] and stinking rot [*Bacillus pyocyaneus saccharum*: ibid., xiv, p. 395; xv, p. 316]. Researches at Pusa, Patna, and Cawnpore during the last three years have shown that in severe cases of mosaic the total loss in Co. 213 may amount to 12 per cent. of the crop, while in Pounda canes the yield is reduced by two-thirds. The predicted failure of the otherwise valuable Co. 213 through mosaic is rapidly being fulfilled, and every effort must be made to secure an equally desirable substitute free from the disease. The problem of control by selection and roguing is briefly discussed.

The conversion of cane sugar into glucose and alcohol by *C. falcatum* (giving rise to the sour smell characteristic of red rot) entails the failure of the juice to crystallize on boiling and leads to considerable losses on the part of the manufacturers. Some years ago this disease was observed in an epidemic form in Pilibhit, Gorakhpur, Shahjahanpur, Bareilly, and Cawnpore, where the fields presented an extraordinary appearance. A few of the older leaves in nearly every plant would break in the middle, where a bright red patch developed; above this point desiccation set in while the lower half remained green except for the discoloured margin at the broken end. An important measure for the control of the disease is the discontinuance of ratooning, which provides a ready means of perpetuation for the fungus in the shape of old stumps.

B. pyocyaneus saccharum is stated to be largely amenable to control by selection and timely roguing, but the borer insects [*Scirpophaga*] implicated in its transmission cannot be effectively combated.

McKaig (N.) & Fort (C. A.). **Chemical composition of juice of Louisiana Sugarcane injured by the Sugarcane borer and the red rot disease.**—*J. agric. Res.*, lii, 1, pp. 17–25, 1936.

The results of tests in 1931 and 1932 in Louisiana showed that both the quantity and quality of the juice extracted from the commercial sugar-cane varieties P.O.J. 36–M, P.O.J. 213, P.O.J. 234, and Co. 281 are materially reduced by attacks by the sugar-cane borer (*Diatraea saccharalis*), the reduction being still greater in canes exhibiting a combination of injuries from the borer and the red rot disease (*Colletotrichum falcatum*) [see preceding abstract]. The reduction in quality involved an increase in the colour and turbidity of the clarified juices and syrups, in the mineral constituents of the juice, and in protein and non-protein nitrogen compounds, especially of the latter. The changes in the chemical composition of the juice were generally greater in the

case of the susceptible variety P.O.J. 213 than in the other varieties tested.

Destructive Insect and Pest Acts, England. The Sale of Diseased Plants (Amendment) Order of 1936. Dated February 27, 1936.—2 pp., 1936.

An Amendment (effective as from 1st May, 1936) to the Sale of Diseased Plants Order of 1927 [*R.A.M.*, vi, p. 447] extends the provisions of that Order in such a way that it will be an offence to sell, offer, or expose for sale, or, after sale, to deliver for planting in England, any plant substantially affected by the diseases specified in the original order [i.e., fruit tree cankers [including *Nectria galligena*], American gooseberry mildew (*Sphaerotheca mors-uvae*), silver leaf (*Stereum purpureum*), and powdery scab (*Spongospora subterranea*) of potatoes]. Similar regulations, to take effect from 15th May, 1936, have been issued (14th April) by the Department of Agriculture for Scotland (4 pp.), with the substitution for *S. subterranea* on potatoes of *Urocystis cepulae* on onions [cf. *R.A.M.*, xiv, p. 544].

British Guiana. Ordinance No. 37 of 1935.—8 pp., 1935.

The Plant Diseases and Pests (Prevention) Ordinance, 1935 (published 28th December) of British Guiana defines the regulations governing the importation and exportation of plants and the precautions to be taken against the introduction, transmission, and spread of diseases and pests within the Colony.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, viii, 1, pp. 20–23, 25–26, 28–29, 1936.

GERMANY. Regulations similar to those enforcing the destruction (where treatment is no longer indicated as profitable) of fruit trees attacked by canker [*Nectria galligena*] and other diseases and pests in Saxony [*R.A.M.*, xiv, p. 736] have been issued in respect of Saarland (7th January, 1936) and Thuringia (21st December, 1935).

FINLAND. An Order of 27th September, 1935, prescribes that all potatoes entering Finland must be accompanied by official certificates vouching for the freedom of the consignments from wart disease (*Synchytrium endobioticum*), which must further be declared to be absent from a radius of at least 50 km. from the place of cultivation. A maximum of 5 per cent. of frozen, mouldy, or otherwise decayed tubers will be admitted. These regulations supersede those of 12th November, 1925, concerning the conditions for the importation of potatoes into Finland and their transit through the country [cf. ibid., v, p. 190]. A list is given of the ports through which entry may be effected.

AUSTRIA. As from 1st January, 1936, special permits from the Federal Ministry of Agriculture are required in respect of all potato consignments from countries deemed to be infested by wart disease [*Synchytrium endobioticum*: ibid., xiv, p. 64], supplies from which should in general be limited to the immediate needs of the population.

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XV AUGUST 1936

SUBRAMANIAM (L. S.). **Some new seedling diseases of Sugar-Cane.**—*Indian J. agric. Sci.*, vi, 1, pp. 11–16, 3 pl. (1 col.), 1936.

Among the fungi found on dying sugar-cane seedlings at the Coimbatore Cane Breeding Station in 1934 were two species of *Helminthosporium* and a *Pythium*, all parasitic. The seedlings attacked by the former were covered with narrow, reddish (later bright to dark brown) stripes and the leaf sheaths assumed a dark brown or olivaceous tinge owing to the formation of numerous conidiophores and conidia. One of the *H.* species was identified by its spore dimensions (20 to 104·5 by 9·5 μ, 3 to 11 septa) as *H. halodes*, a variety of which (*tritici*) has been described by Mitra on wheat in the Central Provinces [*R.A.M.*, x, p. 758]. *H. halodes* caused a very high percentage of infection, not only on different cane varieties but also on maize, sorghum, wheat, and barley, the grey lesions with reddish-brown borders on wheat resembling those due to *H. sativum*. This is believed to be the first record of *H. halodes* on sugar-cane. The second species appears to be identical with *H. tetramera*, isolated by McKinney from foot rots of wheat in the United States [ibid., v, p. 223; xiv, p. 622], and is a relatively weak parasite. No symptoms of *H.* infection were observed on selected seedlings from diseased pans on transplantation in the field.

The *P.* species causing root rot and collapse of very young seedlings was found to agree with *P. graminicolum* [ibid., xiv, p. 530], previously recorded on wheat in Bombay [ibid., viii, p. 34], but not hitherto observed on sugar-cane in India. Wheat, oats, and barley were actively parasitized in cross-inoculation tests, maize and sorghum being mildly attacked.

Evidence was obtained that infection is seed-borne on the susceptible P.O.J. 2725×Co. 243 variety; good control was given by seed and soil treatment with 0·25 per cent. uspulun both at Coimbatore and Pusa.

BRITON-JONES (H. R.). **Problems connected with root disease of Sugar-Cane in Antigua.**—*Trop. Agriculture, Trin.*, xiii, 1, pp. 5–8, 2 figs., 1936.

Sugar-cane root disease in Antigua is associated with a number of fungi, which the author regards as of no practical importance locally. That most commonly identified was *Marasmius sacchari* [*R.A.M.*, xii, p. 115]. The so-called red leaf sheath disease of Ba. 11569 sugar-cane in Antigua is an advanced stage of root disease of the *Marasmius* type and is not caused by *Sclerotium rolfsii* [ibid., ix, p. 808], which was,

however, observed on the leaf sheaths of closely planted B.H. 10(12) canes, and killing tissues at the nodes, including roots and buds. *Bacterium vasculorum* [ibid., xv, p. 397] is found on Ba. 11569, B. 2935, and B.H. 10(12) sugar-canes, but the author does not consider the disease to be of any great significance in Antigua.

Under local conditions the sugar-cane is planted in furrows in order to find soil moist enough to induce germination and to make the maximum use of subsequent light showers. The rainfall is extremely variable in Antigua, particularly in its distribution, with the result that the soil becomes too dry or too wet for satisfactory growth of the cane and root disease sets in. A field may be badly affected and give a poor yield, with a satisfactory one later. A change in the weather may bring about the recovery or the death of sugar-cane previously affected by root disease in the same growing season.

The paper concludes with notes on experiments that are to be carried out on soil tillage, drainage, fertilizers, and varietal qualities and with suggestions for small-scale trials of different methods of subsoil drainage.

Goidànich (G.). **Schema di una classificazione delle Stilbacee che erano riunite fin'ora nel genere Graphium Corda.** [A scheme of classification of the Stilbaceae hitherto included in the genus *Graphium* Corda.]—Reprinted from *Ann. Bot., Roma*, xxi, 1, 11 pp., 1935.

In this reclassification of the genus *Graphium* the author restricts the genus to species with branched synnematous hyphae, segregates those species with unbranched synnematous hyphae into *Nematographium* n.g., recognizes *Graphiopsis* Bainier for forms with pleurogenous conidia borne on spicules, and erects *Pleurographium* n.g. for forms with pleurogenous conidia borne directly on the hyphae [*R.A.M.*, xiv, p. 703].

Lund (A.). **Note on some Sumatran fungi.**—*Dansk bot. Tidsskr.*, xliii, 4, pp. 305–310, 3 figs., 1935.

Taxonomic notes are given on four fungi from a collection made by O. Hagerup in Sumatra during the years 1915–16, including *Aldona stella nigra* Rac., the black radiating apothecia of which occur on dark spots on the leaves of *Pterocarpus indicus*; and a new species of *Pestalozzia* named [with a diagnosis in English only] *P. arengae* n.sp., which was found on *Arenga saccharifera* leaves forming necrotic, greyish or brownish, dark-bordered lesions, up to 7 cm. long.

Riofrío (B. F.) & Font Quer (P.). **Bibliografia micològica de Catalunya o amb referències de fongs catalans.** [A bibliography of papers dealing with the mycology of Catalonia or containing references to Catalan fungi.]—*Cavanillesia*, vii, 10–12, pp. 168–172, 1936.

A list is given of some 50 titles of papers dating from 1913 dealing with the mycology of Catalonia or containing references to the fungi occurring in this province of Spain [cf. *R.A.M.*, vii, p. 407].

Mason (E. W.). **On Cercospora bloxami Berk. & Br.**—*Trans. Brit. mycol. Soc.*, xx, 2, pp. 110–111, 1936.

In current literature two fungi are referred to as *Cercospora bloxami* Berk. & Br. [*R.A.M.*, xii, p. 546]. The first is especially associated with

white spot of turnip leaves in England and is the fungus officially recognized by the plant pathology sub-committee of the British Mycological Society in 1929 as *C. bloxami* Berk. & Br. Consideration of Roumeguère's Fungi sel. exsic. 5679 shows that it is also *Cylindrosporium brassicae* Fautr. & Roum. which von Höhnel in 1924 referred to *Cercosporella* as *C. brassicae* (Fautr. & Roum.) von Höhn. The second fungus is especially associated with the leaves of *Brassica oleracea* and *B. sinensis* in the tropics, and is apparently *Cercospora brassicicola* P. Henn. (though type material was not available to check this).

Cercosporella brassicae is white to the naked eye, the conidia being typically cylindrical and rounded at both ends. *Cercospora brassicicola* appears as blackish tufts to the naked eye, and each conidium, which typically tapers from the base to the apex, has a broad scar right across the base; brown conidiophores with corresponding broad scars are present.

.The specimen at Kew labelled by Berkeley *Septoria bloxami* B. & Br. is clearly the type specimen of *Cercospora bloxami*, the fungus being, in fact, *Alternaria brassicae* (Berk.) Bolle, so that to neither of the fungi currently known as *C. bloxami* can this specific epithet be applied. Accepting *Cercosporella* as a valid genus the correct name for the first fungus is *Cercosporella brassicae* (Fautr. & Roum.) von Höhn. Von Höhnel, from a consideration of the diagnoses, surmised (probably correctly) that *Cercospora* (*Cercosporella*) *albomaculans* Ell. & Ev. (1894) [ibid., vi, p. 454; xv, p. 187] and *Ramularia rapae* Pim (1897) [ibid., iii, p. 688] were synonyms, pointing out also that *Cercospora bloxami* Berk. & Br. had multiseptate spores and was distinct.

Wakefield (E[lsie] M.) & Moore (W. C.). **Notes on certain changes in nomenclature in the second edition of the list of common names of British plant diseases.**—*Trans. Brit. mycol. Soc.*, xx, 2, pp. 97–109, 1936.

In this paper explanations are given for most of the nomenclatorial changes adopted in the revised List of the common names of British plant diseases [*R.A.M.*, xiv, p. 325] now issued as a pamphlet by the Cambridge University Press. Apart from items already noticed the following changes occur: *Ustilago hordei* (Pers.) Kellerm. & Sw. is corrected to *U. hordei* (Pers.) Lagerh., *U. tritici* (Pers.) Jens. to *U. tritici* (Pers.) Rostr., *Helminthosporium avenae* (Bri. & Cav.) Eid. to *H. avenae* Eid. [ibid., xi, p. 294], and *Pyrenophora teres* (Died.) Drechsl. to *P. teres* Drechsl. [cf. ibid., xiv, p. 125]. *Thielaviopsis basicola* (Berk. & Br.) Ferraris (and not *Thielavia basicola* Zopf. [ibid., v, p. 393]) is commonly associated with the rotting of pea roots in Great Britain [ibid., xi, p. 623], and the disease due to this fungus is named black root to distinguish it from 'root rot' due to *Aphanomyces euteiches* Drechsl. *Colletotrichum oligochaetum* Cav. is corrected to *C. lagenarium* (Passer.) Ell. & Hals [ibid., xii, p. 418], *Marssonina panattoniana* Berl. to *M. panattoniana* (Berl.) Magn., *Venturia inaequalis* (Cooke) Aderh. to *V. inaequalis* (Cooke) Wint. emend. Aderh., *Physalospora cydoniae* Arn. to *P. obtusa* (Schw.) Cooke [see below, p. 472], *Plectodiscella veneta* Burkh. to *Elsinoe veneta* (Burkh.) Jenk. [ibid., xii, p. 771], *Sclerotinia gladioli* (Massey) Drayton to *S. gladioli* Drayton [ibid., xiii, p. 461], and

Gloeosporium ampelophagum is listed as a synonym for *E. ampelina* Shear. *Heteropatella valtellinensis* (Trav.) Wr. is adopted for *Pseudodiscosia dianthi* [ibid., ix, p. 247].

The three pea diseases caused by three distinct species of *Ascochyta* in America all exist in Great Britain. *A. pisi* Lib. produces leaf, stem, and pod-spotting only, and the name suggested for this is leaf and pod spot. The other two organisms, *Mycosphaerella pinodes* (Berk. & Blox.) Stone and *A. pinodella* (L. K. Jones), affect the plant in much the same way, but may attack the base of the stem, causing foot rot [ibid., xv, p. 273]. The two last-named, together with species of *Fusarium* frequently associated with a stem rot of peas in the west of England [ibid., xi, p. 144], are grouped together as the pathogens of a disease to which the name foot rot has been applied.

The name 'spraing' is retained for the potato disease exhibiting arc-like lesions, the term 'internal rust spot' being applied to the blotch type of lesion [ibid., xiii, p. 650]. Club root is adopted for the crucifer disease caused by *Plasmodiophora brassicae* in preference to finger-and-toe.

Turnip and swede soft rot, originally ascribed to *Bacillus carotovorus* L. R. Jones and *Pseudomonas destructans* Potter, is now attributed only to the former. The name of the onion and shallot downy mildew, usually known as *Peronospora schleideni* Unger, is corrected to *P. schleideniana* W. G. Smith [ibid., xii, p. 484]. As far as can be ascertained Smith first mentioned the oospores in 1884 under the name *P. schleideniana*, a combination made by de Bary in 1863, but invalid because applied instead of *P. schleideni* to the conidial stage.

The common name for the cabbage disease caused by *Phoma lingam* (Tode) Desm. is changed from stem rot to canker.

Myxosporium corticolum is altered to *M. corticola*, the latter word being a noun used in apposition with the former. The fungus was first described as *Dermatea corticola* Arn. [ibid., xv. p. 202], and named by Jørgensen, who was unaware that it had been recorded before *Neofabraea corticola*; Nannfeldt considers *Neofabraea* synonymous with *Pezicula* and has called the apple fungus *P. corticola* (Jørgens.) Nannf. If this synonymy be correct, the proper citation is *P. corticola* (Arn.) Nannf.

The correct authority for the name *Penicillium gladioli* is McCull. & Thom [ibid., vii, p. 448] as given in the first edition of the list, and not *P. gladioli* Machacek as in the second, since the former name ante-dated the latter by four days.

In view of Miss Waterman's conclusions that *Coniothyrium fuckelii* Sacc. and *C. rosarum* Cooke & Harkn. are identical [ibid., ix, p. 722], rose graft disease previously attributed to the latter has been omitted. from the list, stem canker now being attributed to *Leptosphaeria coniothyrium* (Fuck.) Sacc. [ibid., xiv, p. 313]; the so-called brand canker due to *C. wernsdorffiae* Lanb. has not yet been found in England.

In the first edition *Viola* and violet leaf spot was attributed in part to *A. violae* Sacc. & Speg., but the evidence indicates that the fungus commonly causing violet leaf spot in England does not correspond to the original description; it seems to agree closely with that of *Phyllosticta violae* Desm., to which it is provisionally referred.

HUNTER (LILLIAN M.). **The genus Milesia in Great Britain and Ireland.**—*Trans. Brit. mycol. Soc.*, xx, 2, pp. 116–119, 1936.

In studies conducted in England in 1933–4 on the life-histories of species of *Milesia* [*R.A.M.*, xiv, p. 410] the author in artificial inoculations with basidiospores from the teleutospores on the fern hosts obtained the spermagonia and aecidia of the following species for the first time, viz.: *M. scolopendrii* from *Scolopendrium vulgare* on *Abies alba* and *A. concolor*, *M. polypodii* from *Polypodium vulgare* on the same two hosts, *M. vogesiaca* from *Polystichum angulare* on *A. alba*, and *M. kriegeriana* from *Dryopteris spinulosa* and *D. filix-mas* on both the foregoing hosts as well as on *A. grandis*. In all these species of *Milesia* the spermagonia appeared from 21 to 30 (average 23) days from the time of inoculation. The time required from the date of inoculation for the appearance of the aecidia varied with the species from 46 to 99 days.

In Great Britain and Ireland hitherto unreported collections of *Milesia* spp. include *M. blechni* on *Blechnum spicant*, *M. carpatica* on *Dryopteris filix-mas*, *M. kriegeriana* on *D. filix-mas*, *D. spinulosa*, and *D. spinulosa* var. *dilatata*, *M. murariae* on *Asplenium ruta-muraria*, *M. polypodii* on *Polypodium vulgare*, *M. scolopendrii* on *Scolopendrium vulgare*, and *M. vogesiaca* and *M. whitei* on *Polystichum angulare*.

HUNTER (LILLIAN M.). **The life histories of Milesia scolopendrii, M. polypodii, M. vogesiaca and M. kriegeriana.**—*J. Arnold Arbor.*, xvii, 1, pp. 26–37, 1 pl., 1936.

In this further paper dealing with her studies on the genus *Milesia* in Great Britain and Ireland [see preceding abstract] the author gives full descriptions [without Latin diagnoses] (from her culture material on *Abies*) of the newly discovered spermagonia and aecidia of *M. scolopendrii*, *M. polypodii*, *M. vogesiaca*, and *M. kriegeriana*. The spermagonia of the last two species are distinguishable from one another and from those of *M. scolopendrii* and *M. polypodii* by their form and size, while those of *M. scolopendrii* and *M. polypodii* are similar in these respects.

BOSE (S. R.). **Bengal Polyporaceae.**—Reprinted from *Proc. Indian Sci. Congr., 1936*, 29 pp., 1936.

Following some introductory remarks, the author discusses the geographical distribution of the Polyporaceae in Bengal [*R.A.M.*, xiv, p. 794], the conditions promoting their development, their morphology, taxonomy, and anatomy, the general structure, nutrition, cytology of reproduction, and chemical nature of the fruit body of *Ganoderma lucidum* [ibid., xiv, p. 693; xv, p. 78], some biological peculiarities of Polypores, their physiology, medicinal properties, and other uses. A bibliography of 65 titles is appended.

MOORE (E[NID] S.) & RETIEF (D. F.). **Mildew or white rust of Tobacco.**—*Fmg S. Afr.*, xi, 118, p. 31, 1 fig., 1936.

A popular note is given on mildew or white rust of tobacco [*Erysiphe cichoracearum*: *R.A.M.*, xv, p. 425], in connexion with the increasing

importance of which in South Africa the following system of priming is recommended. The operation should be commenced when the plants are about 12 in. high, and at suitable intervals thereafter the lower leaves should be removed, a few at a time, until the crop has been topped and is about to mature, when all the leaves to a height of some 12 in. from the ground should be taken off; the lowest leaves remaining must not actually touch the ground. Systematic priming on these lines facilitates the free circulation of air round the plants and thus checks the advance of the fungus at its onset.

ALEXANDER (L. J.). **Progress in the development of a new Tomato variety resistant to leaf mold.**—Abs. in *Phytopathology*, xxvi, 2, p. 86, 1936.

Failure to secure either parental type from crosses between individuals of the small-fruited, homozygous lines of tomato resistant to leaf mould [*Cladosporium fulvum*: *R.A.M.*, xiv, pp. 202, 684; and below, p. 480] and of the large-fruited, homozygous susceptible variety, Globe, necessitated protracted experiments [in Ohio] in back-crossing and selection. At present a number of selections, still heterozygous for resistance, produce an abundance of high-grade fruit, apparently equal to Globe in size. F_1 individuals resulting from crosses between homozygous resistant and homozygous susceptible parents are uniformly resistant, while those of the F_2 progenies segregate into a ratio approximating to 3 resistant : 1 susceptible. Progeny tests with 82 F_2 plants yielded 19 homozygous resistant, 42 heterozygous resistant, and 21 homozygous susceptible offspring. F_1 plants derived from crosses between heterozygous resistant and homozygous susceptible parents segregate for resistance into a ratio approximating to 1 : 1. In progeny tests, with 122 F_1 plants 59 of the resulting offspring were heterozygous for resistance and 63 homozygous for susceptibility.

HEPTING (G. H.). **Decay following fire in young Mississippi Delta hardwoods.**—*Tech. Bull. U.S. Dep. Agric.* 494, 32 pp., 4 pl., 2 figs., 16 graphs, 1935. [Received May, 1936.]

During 1932, 602 fire-scarred trees (3 to 11 in. in diameter) of 9 species of Mississippi Delta hardwoods were dissected and analysed for decay [cf. *R.A.M.*, xv, p. 409]. It was ascertained that decay spread upwards from the fire scar most rapidly in oak (2·3 in. per year), followed in order by ash, red gum (*Liquidambar styraciflua*), hackberry (*Celtis laevigata*), and persimmon (*Diospyros virginiana*). A definite relationship was established between the rate of decay and each of the following: age of tree, percentage of tree circumference scarred, diameter at times of scarring and examination, and causal organism of the decay.

Cultures were prepared from 251 of the decayed trees, and of these 171 yielded apparently pure cultures of decay fungi; only twice did two cultures taken from the same tree give two different Hymenomycetous fungi, thus showing only one fungus to be responsible for the major decay in any one tree. The fungi found causing decay were *Hydnum erinaceus* [ibid., i, p. 443], an unidentified yellow Hymenomycete, *Polyporus lucidus* [*Ganoderma lucidum*: ibid., xiv, p. 693], *P. fissilis*, *Pleuro-*

tus ostreatus [ibid., xii, p. 343], *Lentinus tigrinus* [ibid., xii, p. 411], two white Hymenomycetes, *Fomes geotropus* [ibid., ix, p. 421], and *P. zonalis* [ibid., vi, pp. 274, 608]. The principal cultural characters of the more important of these fungi are mentioned. The greatest annual rate of decay was caused by *H. erinaceus* (3·5 in. on trees with an average scar age of 23 years), while the unidentified yellow Hymenomycete, found only in overcup oak (*Quercus lyrata*), progressed almost as fast. *F. geotropus*, the fungus most commonly isolated, showed an average progress of 2 in. per annum on trees with an average scar age of 11 years.

WILKINS (W. H.). **Studies in the genus Ustulina with special reference to parasitism. II. A disease of the common Lime (Tilia vulgaris Hayne) caused by Ustulina.**—*Trans. Brit. mycol. Soc.*, xx, 2, pp. 133–156, 1 pl., 8 figs., 1936.

In this second instalment of the author's studies on *Ustulina* [*R.A.M.*, xiii, p. 597] it is stated that a lime tree (*Tilia vulgaris*) brought down by the wind at Oxford showed the presence of *U. vulgaris* [ibid., xiv, p. 667] on the surface of the exposed wood of an old wound in the trunk. Artificial infection with the isolated fungus on healthy living trees and sound wood produced symptoms identical with those present in the infected tree, the organism being reisolated, while inoculations on the lime with a culture from authentic *U. vulgaris* spores produced the same symptoms.

The exposed wood of the wound was soft and rotted, but the rest of the trunk, seen from the outside, appeared to be normal. Internally the wood was discoloured to a height of about 24 ft. from the ground, but was only decayed to a height of about 16 ft.; the latter was friable and abnormally light in weight and colour and delimited from the former by a black line. The mycelium penetrated the whole of the diseased and discoloured areas and black lines also occurred indiscriminately throughout the diseased wood.

It is concluded that *U. vulgaris* can cause a very definite disease of standing lime, and should be regarded as a wood-destroyer producing a white rot that may render the timber commercially worthless as well as completely killing the tree. The disease appears to belong to Campbell's group 2 [ibid., xii, p. 343] of the white rots of wood.

BAVENDAMM (W.). **Der Rindenbrand der Pappeln.** [The bark blight of Poplars.]—*Tharandt. forstl. Jb.*, lxxxvii, 2, pp. 177–179, 1 fig., 1936.

Bark blight of poplars (*Dothichiza populea*, probably the pycnidial stage of *Cenangium populeum*), already reported from Westphalia, Baden, Württemberg, Hanover, Brunswick, and East Prussia [*R.A.M.*, xiii, p. 480], has now made its appearance and started to spread rapidly in Saxony. Quickly growing species, such as *Populus canadensis*, *P. robusta*, *P. eugenei* [*P. monilifera*], *P. simonii* [*P. balsamifera*] and its var. *fastigiata*, *P. brevifolia*, *P. petrowskiana* [*P. canadensis*], and *P. nigra* var. *italica* suffer the most, while *P. alba* and *P. tremula* do not seem to be affected. Good results are reported to have been obtained in nurseries by three to four applications of 2 per cent.

Bordeaux mixture as the trees are coming into leaf, but no systematic scheme of control has yet been formulated in the case of this disease.

Fowler (M. E.). **Sphaeropsis malorum on Abies concolor.**—*Plant Dis. Reptr*, xx, 2, pp. 30–31, 1936. [Mimeographed.]

A species of *Sphaeropsis* agreeing with the description of *S. malorum* Peck [*Physalospora obtusa*: *R.A.M.*, xv, p. 33], reported by N. E. Stevens as an agent of apple black rot [ibid., xiii, p. 312], was isolated from dying *Abies concolor* trees, weakened by unsuitable cultural practices in Maryland. Apples were inoculated with monoconidial cultures both of this organism and of a species of *Sphaeropsis* isolated from Austrian pine [*Pinus laricio* var. *austriaca*] in the same State, the latter being apparently identical with *S. ellisii* [ibid., xv, p. 408] and having conidia measuring 29 to 39 by 13 to 17 μ compared with 20 to 28 by 9 to 14 μ for those of the *Abies* fungus. Both organisms induced a typical black rot of apples, and were recovered from the diseased tissues. *S. malorum* Peck does not appear to have been previously recorded on firs, though it is known to attack other conifers.

Tubeuf [C. v.]. **Verlauf und Erfolg der Erforschung der Blasenrostkrankheit der Strobe von 1887 bis 1936.** [The progress and outcome of research on blister rust disease of *Pinus strobus* from 1887 to 1936.]—*Z. PflKrankh.*, xlvi, 2, pp. 49–103; 3–4, pp. 113–171, 23 figs., 2 maps, 1936.

The history of the writer's constant efforts (which are still proceeding) to secure effective legislation against the blister rust (*Cronartium ribicola*) of *Pinus strobus* and other pines since its introduction into Germany in 1887 is traced in the form of a diary [*R.A.M.*, xiv, p. 666]. Appendices are added in which are discussed, with extended references to the literature, various aspects of the disease, including its life-history, the development of the disease in America and on *Pinus cembra* in the Tatra mountains [Czecho-Slovakia] and the studies by the author and E. Lechmere of the parasitism of *Tuberculina maxima* [ibid., xv, p. 331] on *C. ribicola* (reprinted from *Naturw. Z. Forst- u. Landw.*, p. 484 *et seq.*, 1914). The present paper is largely controversial and deals with the author's failure to enlist the understanding and co-operation of his colleagues in his aims.

Liese (J.). **Beiträge zum Kiefernbaumschwammproblem.** [Contribution to the Pine tree fungus problem.]—*Forstarchiv*, xii, 3, pp. 37–48, 5 figs., 1 graph, 1 map, 1936.

The writer summarizes and discusses the observations made by himself and others on various aspects of the disease caused by *Trametes pini* on pine, larch, and other conifers [*R.A.M.*, xiv, p. 663] in Germany. The fungus predominates in the easterly regions with a mean annual rainfall below 600 mm. and chiefly attacks trees with extensive heartwood formation. Infection of the living tree takes place only through the heartwood branch stumps and is followed by the formation of a protective zone of wood, composed of dead cells with an abundance of resin, separating the living from the dead portions. The

restriction of *T. pini* to trees over 30 years old is due to the absence of the necessary heartwood material in the branches of younger ones. Once established in the heartwood the fungus is able to migrate to the sapwood. The infected areas of the heartwood turn first reddish, later yellowish-brown; the middle lamella is the first part to disintegrate, and this process results in the collapse of the cells into holes containing remnants of cellulose. Even in an advanced stage of decay the affected wood is remarkably firm compared with that infected by saprophytes and may be used for a number of purposes.

The minimum, optimum, and maximum temperatures for the development of *T. pini* are 5°, 25°, and 32° C., respectively, its daily growth in length in pure culture at 25° being 2·5 mm. as against 1·6 mm. at room temperature; in nature the fungus may develop at the rate of 20 to 25 cm. a year under favourable conditions, probably on an average about 18 cm.

The possibility of combating the fungus by the injection of water-soluble fluorides and by appropriate silvicultural practices is briefly discussed.

Observations en matière forestière en 1934. [Observations on forest matters in 1934.]—*Bull. Soc. for. Belg.*, xliii, 1, pp. 23–31, 1936.

In the section of this paper dealing with fungal diseases of forest trees in Belgium it is stated that during 1934 oak mildew (*Oidium quercinum*) [*Microsphaera quercina*: *R.A.M.*, xv, p. 63] was much less prevalent and caused little damage. *Peridermium strobi* [*Cronartium ribicola*: ibid., xv, p. 330] occurred sporadically all over Belgium on Weymouth pine [*Pinus strobus*]; *Polyporus* [*Fomes*] *fomentarius* [loc. cit.] was found occasionally on beeches in the forest of Soignes; the ring disease of conifers (*Armillaria mellea*) [associated with *Rhizina undulata* and *F. annosus*: ibid., xii, p. 798] continued to cause damage in a number of districts; *Lophodermium pinastri* [ibid., xv, p. 267] was appreciably less prevalent; and *Peridermium pini* [var.] *acicola* [ibid., vi, p. 201; vii, p. 415] affected young pine plantations, though much less severely than in the three preceding years.

Georgescu (C. C.) & Badea (M.). **Căderea acelor de Juniperus, cauzată de o ciupercă nouă Camarosporium juniperinum Georgescu et Badea nov. sp. Comunicare prealabilă.** [Needle fall of *Juniperus* caused by a new fungus, *Camarosporium juniperinum* Georgescu & Badea nov. sp. Preliminary note.]—*Rev. Pădurilor*, xlvii, 3, pp. 155–162, 8 figs., 1935. [French and German summaries.]

Camarosporium juniperinum n. sp., found causing needle fall of *Juniperus communis* in the Brețcu (Eastern Carpathian) mountains, Rumania, is characterized by subepidermal, spherical, ostiolate pycnidia, up to ½ mm. in diameter, occurring in pairs on either side of the midrib on the upper surface of the dead needle; olive-brown peridia; olive-brown, oval spores, rounded at both ends, with 7 transverse and 3 longitudinal septa, 22 to 23 by 9 to 10·5 μ; and uniseptate conidia arising by terminal constriction from the papillae surrounding the ostiole.

GOIDÀNICH (G.). **Nuovi casi di tracheomicosi da 'Verticillium' in Italia. Osservazioni su una specie nuova di 'Verticillium' tracheicolo.** [New cases of tracheomycosis caused by *Verticillium* in Italy. Observations on a new species of tracheid-inhabiting *Verticillium.*] —*Boll. Staz. Pat. veg. Roma*, N.S., xv, 4, pp. 548–554, 1935. [Received April, 1936.]

Notes are given on the occurrence of *Verticillium albo-atrum* causing tracheomycosis [*R.A.M.*, xiv, p. 265; xv, p. 129] on new hosts in Italy.

A single case of verticilliosis of the elm (*Ulmus campestris*) [ibid., xiv, pp. 406, 664] was observed near Potenza, the external and internal symptoms of which resemble closely those due to *Graphium* [*Ceratostomella*] *ulmi* [ibid., xv, p. 407]. In the former disease, however, the effects are less conspicuous, the discoloration of the xylem is less intense and the tylosis less marked, while the discolorations may disappear. In the south of Italy the elm disease caused by *C. ulmi* is mainly slow and chronic, whereas in the north it is exceedingly rapid.

Tracheoverticilliosis was found on *Robinia pseud-acacia* [ibid., xii, p. 665] in 1933 in three localities causing an almost black discoloration of the xylem. It was slowly fatal to *Cercis siliquastrum* growing at Bologna where it also affected *Sophora japonica*, on which it progressed very slowly, the affected wood being nearly black. Two large *Ailanthus glandulosa* trees at Loano, Liguria, were also infected [cf. ibid., xv, p. 183].

The author again refers all strains of *Verticillium*, including the recently recorded *V. amaranthi* [ibid., xiv, p. 765], to *V. albo-atrum* [ibid., xiv, p. 265].

THOMPSON (J. R.). **Cylindrosporium concentricum Grev.**—*Trans. Brit. mycol. Soc.*, xx, 2, pp. 123–132, 8 figs., 1936.

A fungus forming white spots on cabbage leaves in gardens in the Edinburgh district was found upon comparison with the type specimen of Greville's *Cylindrosporium concentricum* to be identical with the latter. Inquiries showed the fungus to be fairly widely distributed though nowhere abundant in England and Scotland, cauliflowers and broccoli also being affected. Only the outer leaves are attacked and the fungus has no serious effect on the host.

The individual spots are minute, less than 1 mm. in diameter, but they are grouped in concentric circles, each group measuring 1 to 2 cm. in diameter. As new spots form on the outside of the group those in the centre disappear and the leaf turns yellow then black, until finally only a number of concentric black lines remains. From the spot is exuded a gelatinous mass of cylindrical, sometimes curved spores with rounded ends (not truncate as described by Greville), measuring 8·5 to 15 by 2·5 to 5·5 (average 11 by 4) μ. Sections through fructifications showed them to be formed beneath the cuticle.

In culture the fungus grew very slowly, the submerged mycelium being greyish in colour and the superficial white and cottony. Later white, gelatinous pustules appeared, resembling the spots on cabbage and like them consisting of masses of spores. The spores were budded off irregularly from the hyphae, there being no specialized sporophores,

and were produced laterally or terminally in succession, lying loosely in irregular chains. At a late stage small, black, sclerotium-like spherical or lobed bodies without any definite internal structure were sometimes produced. In its final form, black, radiating lines appeared in the growth, giving it a dark appearance, though the periphery remained grey.

The author considers that the fungus is not a typical *Gloeosporium*, to which genus it was transferred by Berkeley and Broome, and points out that though, as von Höhnel thought, its habit, the whiteness of the fructifications, and the probable arrangement of the spores in chains (which von Höhnel suspected from the 'truncate' spores) are in themselves insufficient to distinguish it from *Gloeosporium*, when these characters are combined with the subcuticular acervulus, the formation of spores by irregular budding, and the confirmation of the catenulate arrangement of the spores, there seems good reason for retaining the genus *Cylindrosporium* Grev.

Fedorintschik (N. S.). К вопросу определения вредоносности килы Капусты (**Plasmodiophora brassicae**) и выявления сортовой устойчивости Капусты. [Investigations on the determination of the injuriousness of Cabbage club root (*Plasmodiophora brassicae*) and of varietal resistance in the Cabbage.]—*Pl. Prot. Leningrad, 1935*, 2, pp. 87–95, 2 graphs, 1935. [English summary. Received May, 1936.]

In the small scale experiments briefly described in this paper (which were carried out in 1934 in the Leningrad vicinity on soil heavily infected with *Plasmodiophora brassicae*) [*R.A.M.*, xiv, pp. 148, 277; xv, p. 335], the degree of infection of individual plants belonging to 15 varieties of cabbage by club root was designated by numbers: 1, indicating the attack of isolated lateral rootlets; 2, up to 50 per cent. infection of the lateral roots; 3, infection of the main root and the same amount of infection of the lateral roots as in 2; and 4, over 50 per cent. infection of the whole root system. The results were analysed statistically, and indicated that type 4 infection reduced the weight of the affected cabbages to about 50 per cent. of that of healthy cabbages, type 3 by about 10 per cent., while types 1 and 2 either gave no reduction or even resulted in a slightly greater weight of the infected plants. After successful establishment of club root, the progress of the organism in the host tissues was apparently the same in all varieties. While no variation in susceptibility to infection was noticed within a given variety, some of the varieties, e.g., Bronka, short-stemmed Amager, Slavianka, and late Moscow, showed a higher degree of resistance to infection than the others, Braunschweig Gribovka, Braunschweig Hos-Hos, White Russian, and No. 1 being the most susceptible ones.

Jamalainen (E. A.). **Der Einfluss steigender Borsäuremengen auf die Kohlrübenernte.** [The influence of increasing amounts of boric acid on the yield of Swedes.]—*Maataloust. Aikakausk.*, vii, 4, pp. 182–186, 1935. [Finnish summary.]

No adverse effects followed the application to swedes at the Tikkurila Agricultural Experiment Station, Finland, of boric acid at the rate of 5,

10, 15, 25, or 50 kg. per hect., and even at that of 100 kg. the resultant shrivelling of the foliage was only of brief duration. In the absence of brown heart [*R.A.M.*, xv, p. 416] the influence of the treatments on this disease could not be determined, but in two previous field tests its incidence was reduced from 81·1 and 70·4 per cent. to 1 and 2·3 per cent., respectively, without damage to the leaves or yield by boric acid at the rate of 8 kg. per hect. These results were somewhat contrary to expectation, inasmuch as in laboratory trials the presence of minute quantities of boric acid in the culture vessels sufficed to inhibit growth.

MEYER-BAHLBURG [W.]. **Vorausbestimmung des Zuckerrüben-Befalls durch Herz- und Trockenfäule.** [Prediction of Sugar Beet infection by heart and dry rot.]—*Dtsch. landw. Pr.*, lxiii, 6, p. 67, 1936.

There is considered to be no doubt that the borax treatment for the control of heart and dry rot of beets [*R.A.M.*, xv, p. 414 *et seq.*] would soon become a part of the general routine of cultivation if the approximate extent of the damage could be predicted and plans made accordingly. In this connexion some of the factors influencing the development of the trouble are indicated. Meteorological conditions during the summer are of outstanding importance, a severe drought, such as prevailed in 1935, conducing to heavy outbreaks of the disease in soils normally bearing healthy crops. It is often possible to avoid the expensive borax treatment by adjusting the hydrogen-ion concentration of the soil to the requirements of the beet crop by means of judicious modifications in the fertilizing scheme, but where there is actually an excess of lime (to be determined by the electrometric method) the application of borax at the rate of 15 to 20 kg. per hect. is indispensable. In most cases of true lime excess the soil reaction will be found to lie in the region of P_H 7·2 to 7·7. The soil reaction, however, is not decisive in the development of heart rot, which has been observed in a severe form on a sandy heath soil (P_H 5·7 to 6·2) limed in 1911 with marl; the oat crops on this soil suffer from grey speck [ibid., xv, p. 355].

SCHARRER (K.) & SCHROPP (W.). **Gefäss- und Wasserkulturversuche über die Wirkung des Bors allein und in Kombination mit Jod in Düngemitteln.** [Vessel- and water culture experiments on the action of boron alone and in combination with iodine in fertilizers.]—*Phytopath. Z.*, viii, 6, pp. 525–540, 6 figs., 1935.

A detailed, tabulated account is given of the writers' laboratory experiments to compare the effects of Chile saltpetre known to contain small quantities of boron with synthetic sodium nitrate, with and without the addition of boron and iodine, on the health and yield of beets [cf. *R.A.M.*, xiii, p. 796, and preceding abstract]. It was apparent from the results of the tests that boron was of outstanding importance in the prevention of heart and dry rot and increase of yield in fodder beets. Sodium nitrate and iodine without boron failed to counteract the tendency to this disease in the slightly acid clay soils of Weihenstephan, and Chile saltpetre gave comparable results with those of sodium nitrate plus boron in various experiments. Fodder beets were found to require more boron than the sugar-producing varieties, in which the occurrence of heart and dry rot was less frequent and intensive.

Nitsche (G.), Klee (H.), & Mayer (K.). **Befallsstärke und Ergebnisse der Bekämpfung der Rübenwanze im schlesischen Seuchengebiet 1935. II.** [Incidence of the Beet bug and results of the control campaign in the infested area of Silesia in 1935. II.]—*NachrBl. dtsch. PflSchDienst*, xvi, 2, pp. 15–16, 1 map, 1936.

The incidence of the beet leaf bug [*Zosmenus quadratus*] in the infested area of Silesia in 1935 was estimated by counts in at least 20 beet plantings in each of 20 administrative districts of the number of plants affected by crinkle [in the transmission of which the insect is implicated: *R.A.M.*, xiv, p. 548]. From the resultant data the average infestation was found to range from 1 to 35 per cent., the lower figures corresponding either to the newly affected border regions or to those in which systematic control measures had been practised. In Guhrau, for instance, where infection was extremely severe even a few years ago, the regular use of traps has reduced the incidence of infestation to 3 per cent. and adequate yields have been secured.

Young (P. A.). **Sclerotinia rot of Squash and Pumpkin.**—*Phytopathology*, xxvi, 2, pp. 184–190, 2 figs., 1936.

The following are reported as new hosts of *Sclerotinia sclerotiorum* in Montana in addition to squash and pumpkin, a preliminary notice of the disease on which has already appeared [*R.A.M.*, xiv, p. 420]: beans (*Phaseolus vulgaris*), peas, carrot, celery, lettuce, potato, Shasta daisy (*Chrysanthemum maximum*), *Zinnia elegans*, and white and yellow sweet clovers (*Melilotus alba* and *M. officinalis*).

Müller (K.). **Die biologischen Grundlagen für die Peronosporabekämpfung nach der Inkubationskalender-Methode.** [The biological foundations for *Peronospora* control by the incubation calendar method.]—*Z. PflKrankh.*, xlvi, 2, pp. 104–108, 1936.

This is a condensed account of the writer's biological studies (with H. Sleumer) on *Peronospora* of the vine [*Plasmopara viticola*] in relation to its control as indicated by the incubation calendar, a notice of which was given from the original source [*R.A.M.*, xiii, p. 678].

Jenkins (Anna E.) & Giltner (L. T.). **Inoculation of rabbits with Elsinoe ampelina.**—*Phytopathology*, xxvi, 2, pp. 191–194, 1 fig., 1936.

Attention has already been drawn [*R.A.M.*, xv, p. 362] to the negative results of inoculation experiments on rabbits with *Elsinoe ampelina*, the agent of vine anthracnose, details of which are here presented. The positive results reported by Charrin and Le Play (*Rev. Vitic.*, xxiv, pp. 521–523, 1905) are thought to be due to impure or misidentified cultures.

Teterevnikova-Babayan (Mme D. N.). Устойчивость армянских сортов Виноградной лозы против оидиума. [Resistance of Armenian varieties of the Vine to *Oidium*.]—*Pl. Prot. Leningrad*, *1935*, 2, pp. 97–103, 1935. [English summary. Received May, 1936.]

The author states that she availed herself of the fairly heavy develop-

ment in 1930 of vine *Oidium* [*Uncinula necator*] in Armenia to obtain records of the reaction of local varieties of the vine towards the disease. The results [which are tabulated] indicated that thick-skinned and highly pigmented grapes are much more resistant to infection than the thin-skinned and light-coloured varieties, and that dense, closely packed bunches suffer more from the disease than the looser ones. The local wine varieties Malai, Black Kakhet, Black Khardji, and the table varieties Lalibedan, Kishmish, and Shir-Shira showed marked resistance to attack by *U. necator* both of the fruit and foliage.

GRANJON (J.). **Les soufres noirs.** [Black sulphur dusts.]—*Rev. Vitic., Paris*, lxxxiii, 2162, pp. 361–367, 1935.

In a prefatory editorial note it is stated that of recent years the use of 'soufre noir' [black sulphur] for the control of *Oidium* [*Uncinula necator*] of the vine has been rapidly gaining ground in southern France and in Algeria owing to its efficacy against the disease and to its considerably lesser cost than the ordinary sulphur dusts. The product is prepared by trituration, after drying and extraction of cyanogen compounds, of the exhausted substances used in the purification of lighting gas. The physical and chemical properties of the product now marketed by different firms are very variable, but all the brands in principle contain free sulphur, sulphocyanides, ferrocyanides, ammonium salts (especially ammonium sulphate), traces of coal tar, and more or less complex organic bases, such as naphthalene and pyridine, mixed with an inert carrier, such as iron oxide, iron sulphate, or calcium carbonate. Of all these constituents the sulphocyanides alone have been experimentally shown to be deleterious to the vine, especially ammonium sulphocyanide, the content of which in the dust should not be higher than 0·35 to 0·4 per cent. by weight. Ferrocyanides, on the other hand, are innocuous to the vine, but their content should be less than 2 per cent., since at higher doses these products tend in free air to react with sulphur, producing noxious sulphocyanides. The free sulphur content of the various brands now on sale varies from 30 to 50 per cent., the most popular in use containing over 40 per cent.

The paper terminates with a brief account of a rapid method to determine the content of the product in sulpho- and ferrocyanides. In the editorial note it is also stated that the black sulphur should be mixed with 30 to 40 per cent. of impalpably ground spent lime, and that the applications of the mixture on the vine should be very light.

England and Wales: new and interesting phytopathological records for the year 1935.—*Int. Bull. Pl. Prot.*, x, 3, pp. 49–50, 1936.

According to a communication from the Ministry of Agriculture and Fisheries, the following fungi (in addition to four recorded from other sources) were observed in 1935 on hosts new for England and Wales: *Penicillium gladioli* [see above, p. 468] on *Montbretia*, *Oidium* sp. on sugar beet, *Phytophthora parasitica* on *Gloxinia*, *Rosellinia necatrix* on *Cyclamen neapolitanum* and *Viola odorata*, *Sclerotinia trifoliorum* [*R.A.M.*, xv, p. 299] on vetches, and *Armillaria mellea* on hops, *Andromeda* sp., and *Ceanothus* sp.

Plagas del campo. Memoria del Servicio Fitopatológico Agrícola. Año 1934. [Field pests. Report of the Phytopathological Agricultural Service for the year 1934.]—Issued by Min. Agric., Diréco. gen. Agric., Secc. 3a, 348 pp., 1935.

This report, compiled on the same lines as that for 1933 [*R.A.M.*, xiv, p. 424], comprises accounts of the work of the agricultural sections of the provinces and the national service of phytopathological inspection, together with summaries of the investigations pursued at nine phytopathological stations in various parts of Spain. An appendix is added containing the legislative measures promulgated in the country during the year and forms of certification for the export and import of various plants.

Jahresbericht der Versuchs- und Forschungsanstalt für Wein-, Obst- und Gartenbau in Geisenheim am Rhein. [Annual Report of the Viticultural, Fruit Growing, and Horticultural College at Geisenheim-am-Rhein.]—*Landw. Jb.*, lxxxii, 4, pp. 667–696, 1936.

The following items of phytopathological interest, besides those noticed from other sources, occur in this report covering the financial year 1934 [cf. *R.A.M.*, xiv, p. 79]. There is reason to suspect that the 'reisig' disease of vines [ibid., xiii, p. 422] in the Ahr valley is associated with the comparatively low local nocturnal temperatures, which give rise to metabolic disturbances and accumulation of starch. Noll (in an unpublished report to the Minister of Agriculture) states that all the organs of diseased vines are heavily charged with sugar and starch. Observations by K. Kroemer and H. Moog shows that Petri's intracellular cordons [ibid., xi, p. 21] occur in apparently sound and fertile 70-year-old stocks.

A study has been made of the physiology, morphology, and taxonomy of *Rhacodium cellare* [ibid., iv, p. 396], which grows with extreme luxuriance on cellar walls and all sorts of surfaces harbouring dust or the smallest trace of organic material. As a result of cultural investigations the conclusion was reached that the fungus belongs to the genus *Cladosporium* and should be known as *C. cellare*. Chitinous substances afford a particularly favourable substratum for the fungus, the hyphae of which contain chitinase among numerous other enzymes.

The following preparations (tested by the wood block method against *Coniophora cerebella* [*C. puteana*]) were found to be suitable for use as timber preservatives in horticultural and viticultural concerns: totix-normal, totix-wetterfest [weather-resisting], hydrasil, antorgan, and zyman.

The incidence of die-back of elms caused by *Graphium* [*Ceratostomella*] *ulmi* appears to depend, not only on varietal susceptibility to the disease [ibid., xv, p. 183], but also on external conditions, especially drought.

Jahresbericht der Preussischen landwirtschaftlichen Versuchs- und Forschungsanstalten in Landsberg (Warthe), Berichtsjahr 1. April 1934 bis 31. März 1935. [Annual Report of the Prussian Agricultural and Research Stations at Landsberg (Warthe) for the administrative year from 1st April, 1934 to 31st March, 1935.]—*Landw. Jb.*, lxxxii, 4, pp. 477–511, 1936.

The following items are taken from the section in this report (pp. 486–

495) dealing with the work of G. O. Appel and his collaborators at the Landsberg Phytopathological Institute [cf. *R.A.M.*, xiv, p. 78]. The fluorometric method of diagnosing potato degeneration (based on the response of the living tissue to certain fluorescent solutions) is stated to have given promising results in preliminary tests on 15,640 tubers of the Ackersegen, Erdgold, Parnassia, Preussen, and Weltwunder varieties.

The tomato varieties showing resistance to leaf mould (*Cladosporium fulvum*) [loc. cit. and below, pp. 481, 522] for two years succumbed to the disease in the third, and the prospects of breeding for immunity from this destructive malady are not considered to be very hopeful [but see above, p. 470]. On the other hand, a new organic fungicide is stated to have given excellent control of the fungus.

In greenhouse and field experiments on one-year-old wild apple seedlings under controlled conditions, the first symptoms of apple scab (*Venturia inaequalis*) infection were observed between 14th and 18th May, the result of an attack on 26th April, when the weather was rainy and the trees were beginning to blossom, so that the ejection of the ascospores was facilitated [ibid., xv, p. 375]. The hot, dry summer prevented the further spread of the disease, but from August to the end of October fresh infections occurred sporadically on wet days, showing the necessity of late sprays to avoid losses in storage [ibid., xiv, p. 111; xv, p. 302]. In inoculation experiments with monospore cultures on grafted trees it was found essential to maintain a temperature below 25° C. (preferably between 15° and 20°) and to keep the leaves sufficiently damp for the spores to germinate and penetrate the tissues. The following conidial diameters were attained by strain A124 at different temperature ranges: 13° to 23°, 16·02 by 7·24 μ; 11° to 23°, 16·32 by 7·06 μ; 11° to 20°, 16·83 by 7·24 μ; and 9° to 18°, 17·78 by 7·73 μ. Of 38 monospore strains of *V. inaequalis* [ibid., xiv, p. 316] isolated from a single lesion on one of the experimental seedlings, 36 were found to be identical in morphological, physiological, and other features, one was markedly different (especially at 28°, at which temperature it made good growth and sporulated while most of the strains failed to develop at all), and another could not be definitely classified. [A paper by K. Küthe embodying these researches appears in *Gartenbauwiss.*, ix, pp. 405–420, 1936.]

EASTHAM (J. W.). **Report of Provincial Plant Pathologist.**—*Rep. B.C. Dep. Agric. 1935*, pp. AA29–AA38, 1936.

Some reduction in the rotting of cherries (chiefly due to *Sclerotinia cinerea* [*S. laxa*] and to a lesser extent to *Botrytis*, *Penicillium*, and *Rhizopus*) after picking in British Columbia [*R.A.M.*, xiv, p. 495] was effected by spraying with lime-sulphur, but on the whole the economic advantage derived was inconsiderable. In one experiment the treatment temporarily improved the keeping quality of the fruit by reducing the incidence of the three last-named fungi, *S. laxa* being absent. A foliar mottling of cherries, first observed at Nelson in 1932 [ibid., xiv, p. 494; cf. ibid., xv, p. 345] has been shown by [H. R.] McLarty to be of virus origin and readily transmissible to healthy trees by budding or grafting. The disease, which affects the three chief commercial

varieties, Bing, Lambert, and Royal Anne, also causes distortion and stunting of the leaves and insipidity or bitterness of the fruit. A few cases have been detected in the Kootenay Lake commercial orchards.

The results of experiments in the control of *Neofabraea malicorticis* [ibid., xv, p. 74] on apples indicated that Bordeaux mixture is slightly more effective than bouisol (4·5 pints in 100 galls. water) [ibid., xiv, p. 718], whereas the latter at this strength is superior to Burgundy and may be used as a spray prior to picking.

Studies by W. R. Foster and two collaborators on the reaction of a number of wheat varieties to *Tilletia levis* and *T. tritici* [*T. foetens* and *T. caries*] showed that Red Winter, Turkey Red Winter, Oro, Ridit, Albit, Jenkins×Ridit, Hussar, and White Odessa are practically immune [ibid., xv, p. 344], Yaroslav highly resistant, and Kanred Minhardi, Svea, Turkey×Minessa, and Kanred×Bel. Buffum moderately so. The incidence of infection was found to be most severe at a temperature of 45° to 50° F., and it is thought that a considerable reduction would follow early (August) or late (last week or so of October) sowing.

The F_1 progeny of a cross between Cornell F_5 tomato, which is resistant to leaf mould (*Cladosporium fulvum*) [see preceding abstract], and the susceptible Kondine were very resistant, showing the factor for resistance to be dominant. The disease was almost completely controlled by weekly applications of vaporized sulphur by means of the sulphur nebulator. *Uromyces betae* [ibid., xv, p. 191] was recorded on seed beets for the first time and *Plenodomus meliloti* [ibid., xv, pp. 27, 445] on lucerne.

Ninth Annual Report of the Commonwealth Council for Scientific and Industrial Research for the year ended 30th June, 1935.—108 pp., 1935. [Received April, 1936.]

In the section of this report dealing with plant investigations (pp. 20–28) it is stated that a movement towards the standardization of the nomenclature of apple storage diseases has been started in Australia in co-operation with the New Zealand Department of Scientific and Industrial Research. Corky pit in New Zealand is identical with internal cork [*R.A.M.*, xv, p. 446] in Australia. Common tree pit or cork on Cleopatra and Sturmer apples in Tasmania is not identical with blotchy core [ibid., xiv, p. 520] in Western Australia, the former being associated with undesirable soils, and the latter with atmospheric dryness.

All wheat varieties tested were equally susceptible to flag smut [*Urocystis tritici*: ibid., xiv, pp. 89, 425] when germinated under normal seasonal soil temperature and moisture conditions. Temperature variations after germination appeared to be the chief factor affecting the amount of damage. Infected plants had a reduced root system.

Of several hundred two-year-old pine seedlings grown from seed from trees affected with needle-fusion [loc. cit.] only one became affected.

In the section dealing with cold storage (pp. 59–69) it is stated that the banana black end fungus (*Gloeosporium musarum*) [ibid., xv, p. 281] is almost invariably found on dead and dying leaves and bracts, few spores being present in the air. Infection of the cut ends mostly occurs

from the outer surface when the bunches are divided into 'singles', and slow ripening under humid conditions conduces to infection. During the summer high temperatures and possibly a soft-natured fruit are factors determining infection.

In stored Jonathan apples scald usually appears in June and July when the fruit is at its climacteric [ibid., xv, p. 161] and does not increase in incidence subsequently. One of the chief sources of wastage in Granny Smith apples is superficial scald, generally controllable by waxed wrappers or delayed storage [ibid., xv, p. 299]. Storage wastage in grapes [ibid., xiv, p. 491] is mainly due to dehiscence (a disorder of senescence) and mould [unspecified], the latter being largely controllable by careful handling.

UPPAL (B. N.) **Appendix K. Summary of work done under the Plant Pathologist to Government, Bombay Presidency, Poona, for the year 1934–35.**—*Rep. Dep. Agric. Bombay, 1934–35*, pp. 175–182, 1936.

The following items, besides those noticed from other sources, occur in this report. The resistance to *Fusarium* [*vasinfectum*] of the D–IX strain of sann hemp [*Crotalaria juncea*: *R.A.M.*, xiv, p. 560; xv, p. 278], already maintained since 1931, is considered to be fully established by the results of soil temperature tank experiments at 28° C. The optimum temperature for the development of the disease was found to lie between 25° and 30°, and infection is most virulent with a soil-moisture content of 10 to 30 per cent. Cross-inoculation tests showed *C. anagyroides* and *C. striata* to be readily attacked by the fungus, while *Cajanus indicus* [*C. cajan*], soy-bean, and *Crotalaria usaramoensis* are apparently immune.

Phytophthora palmivora has been ascertained to be the agent of citrus gummosis and brown rot in Bombay, this being the first record of such symptoms due to the species in question. The jamburi horticultural variety of lemon has shown virtual immunity from infection, but the mosami orange and the pomelo are very susceptible, while an intermediate position is occupied by the common mandarin.

The fungus responsible for powdery mildew of mango [ibid., vii, p. 654; x, p. 326] is thought to be probably *Erysiphe polygoni* on account of its lobate haustoria.

Macrophomina phaseoli [ibid., xiv, p. 560; xv, p. 426], either alone or in conjunction with *F. vasinfectum*, has been isolated from hundreds of samples of Bombay cotton affected by root rot. The plants were found to contract infection readily at soil temperatures from 30° to 34°, but the manifestation of external symptoms seemed to depend largely on air temperatures.

WOLFE (H.). **Report of the Deputy Director (Plant Industry).**—*Rep. Dep. Agric. Kenya, 1934*, i, pp. 37–70, 1936.

The following references to work of pathological interest are made in this report. Attempts at the control of the coffee berry disease [*Glomerella cingulata*: *R.A.M.*, xiii, pp. 217, 764] by palliative measures give little hope of success and the most promising line of attack is to graft selected resistant (Blue Mountain) scions on susceptible stocks in

plantations of the French Mission type, though it is not yet known whether resistance will be preserved under these conditions. A considerable decline in the incidence of take-all of wheat [*Ophiobolus graminis*: ibid., xiv, p. 427] followed the adoption by farmers of appropriate cultural measures, but crop rotation (biennial or longer) will probably be necessary to eradicate the fungus in severe cases.

The new wheat variety N.B. 230 has been of great utility at high elevations where resistance to yellow rust (*Puccinia glumarum*) and to form K. 2 of stem [black] rust (*P. graminis*) [loc. cit.] is a primary consideration. Very promising results were further obtained with the cross 112, which is resistant to *P. glumarum*, extremely so to three forms of *P. graminis*, and withstands infection by K. 2 moderately well at high altitudes. Strains from crosses 130 and 131 are resistant both to yellow rust and to all four forms of black rust, while certain selections from 117 and 122 are equally resistant to *P. graminis* with 112, but only on a level with Kenya Governor in respect of resistance to *P. glumarum*. For the medium and lower elevations cross 58 is likely to prove very satisfactory, being resistant to all four forms of *P. graminis* and sufficiently so to *P. glumarum* to be cultivated up to about 7,000 ft. In a test at the Dominion Rust Research Laboratory, Winnipeg, the incidence of rust infection on the Kabete wheats (progeny of crosses between Kenya Standard and Kabete hybrids) was 10 per cent. and nil on crosses 112, 122, 131, and 58, compared with 65 per cent. on susceptible Canadian varieties.

Summary report of progress, 1935.—*Bull. Me agric. Exp. Sta.* 380, pp. 139–258, 13 figs., 1935. [Received June, 1936.]

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, xiv, p. 495]. In spraying experiments against potato late blight [*Phytophthora infestans*] at the Aroostook Farm, no serious injury resulted from applications of Bordeaux mixture in bright sunlight or at high temperatures [cf. ibid., xiv, p. 708].

In an experiment by D. Folsom tuber-line Green Mountain potato seed produced under a cloth cage in 1933 was planted by the tuber-unit method [ibid., xiv, p. 714] in 1934 in two isolated fields. Records available from 42 acres planted from the resulting crop give about three mosaic hills, eight leaf roll, and three yellow top [ibid., xv, p. 460] per acre, a total of approximately 0·1 per cent. G. W. Simpson also found that isolated tuber-unit seed plots continue to give practical control of virus diseases of potato. Field experiments under controlled conditions in 1934 showed that some 800 aphids (*Myzus persicae* and *Aphis abbreviata*) per plant were necessary to effect mosaic transmission; in greenhouse tests with *M. persicae* and *M. circumflexus* the disease was transmitted only when over 100 aphids per plant were used. Leaf roll was much more readily conveyed from diseased to healthy plants, several instances of its transmission by a single individual of each species being on record.

Blackleg [*Bacillus phytophthorus*] was found by R. Bonde to be largely responsible for seed-piece decay in Aroostook County [ibid., xiii, p. 534], where up to 12 per cent. of infection by this disease was observed in 80 per cent. of the Irish Cobbler and 65 per cent. of Green

Mountain fields examined, the average incidence on the former variety being 1·85 and on the latter 1·17 per cent.

In experiments by W. P. Raleigh and R. Bonde three minutes' immersion in acidulated mercuric chloride gave good control of *Rhizoctonia* [*Corticium solani*: ibid., xv, p. 46] but may injure the tubers unless they are thoroughly dried before storage. Slightly less satisfactory results were given by treatment with organic mercury dips. Seed tubers free from the fungus did not contract infection when planted in the field, suggesting that black scurf is largely attributable to the use of diseased stock. R. Bonde found that immature Green Mountain tubers harvested after heavy rains following a long drought before the foliage was dead were extensively cracked [see below, p. 525], the condition mostly involving the turgid tissues exposed to injury in digging and handling.

In 1935 forty 22-year-old McIntosh apple trees were used for a comparison of full- and half-strength lime-sulphur. The yield of fruit per tree treated by the latter ($\frac{1}{2}$ gall. liquid or 2 lb. dry lime-sulphur to 50 galls. mixture) was 8·4 bush., compared with 6·5 bush. from those treated by the former, an unexpected result in view of the yields of the preceding five years, averaging 3 and 4 bush., respectively. In this moderately severe scab [*Venturia inaequalis*] season the efficacy of the lime-sulphur spray was practically equalled by that of the wettable flotation sulphur [see below, p. 514] and bentonite sulphur dust [ibid., xiv, p. 151].

Osmun (A. V.). **Department of Botany.**—*Rep. Mass. agric. Exp. Sta., 1935* (*Bull.* 327), pp. 23–28, 1936.

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, xiv, p. 683]. In two field trials by C. J. Gilgut on the comparative efficacy of various dry chemical seed treatments, red copper oxide [ibid., xv, p. 282] gave the best stand of lettuce, closely followed by zinc oxide [ibid., xiv, p. 382], the latter being superior for cabbage, radish, carrot, and cucumber. Vasco, a commercial product containing zinc oxide, gave slightly better results in the case of turnips and spinach. Semesan proved to be the most efficacious stimulant for peas, beets (which responded, however, almost equally well to red copper oxide), maize, and onions.

The severity of damping-off among herbaceous plants [ibid., xiv, p. 684] was reduced in W. L. Doran's tests by the application of antimony and potassium tartrate (8 gm. per sq. ft.) to naturally infested soils but not to those heavily inoculated with *Pythium de Baryanum*. Hollyhocks appear to be very tolerant of copper, responding favourably to 20 gm. copper-lime dust and 9 gm. metallic copper, both of which largely prevented damping-off.

C. J. Gilgut found that six applications of flotation sulphur, linco colloidal sulphur [ibid., xv, p. 160], liquid lime-sulphur, and a combination of liquid lime-sulphur, calcium arsenate, and aluminium sulphate gave, respectively, 88, 92, 96, and 95 per cent. control of *Gymnosporangium juniperi-virginianae* [ibid., xv, pp. 232, 303] on Wealthy apple leaves.

A survey of Massachusetts for the presence of Dutch elm disease

(*Ceratostomella ulmi*) under the supervision of A. V. Osmun and M. A. McKenzie gave negative results in respect of this disorder, but led to valuable observations on the very similar troubles caused by *Cephalosporium* [ibid., xiv, p. 406] and *Fusarium* spp. and *Verticillium dahliae* [ibid., x, p. 696].

In tests carried out by H. F. Bergman and W. E. Truran (p. 34 of the report) two applications of 5–3–50 Bordeaux mixture were more effective against rots of cranberries [ibid., xii, p. 231] than two applications of two mercurial sprays, or 25–75 monohydrated copper sulphate and hydrated lime. The Bordeaux treatment was the most effective in controlling rots in storage.

Agricultural research in New Hampshire.—*Rep. N.H. agric. Exp. Sta., 1934*, 31 pp., 1935. [Received June, 1936.]

The following items of phytopathological interest occur in this report. O. Butler's studies on the factors governing lime-sulphur damage on apple leaves indicated that the application of the sprays during very hot weather (30° to 40° C. in the shade) is not so injurious as generally believed [see above, p. 484].

E. J. Rasmussen found that by 17th July brown core had developed in 43 per cent. of the apples from a sod plot receiving 10 lb. sodium nitrate per tree, in 63 per cent. of those from a cultivated plot to which 5 lb. sodium nitrate per tree was applied, and in 80 per cent. of those of a sod plot given a complete fertilizer including 10 lb. sodium nitrate per tree. A slight delay in the storage of McIntosh apples considerably reduced susceptibility to brown core without appreciably increasing breakdown or curtailing the storage life. Cortland apples picked about the time of McIntosh harvest were found on removal from storage to be very subject to scald [ibid., xv, p. 300 and above, p. 482], even when wrapped in oil paper, whereas fruit picked three weeks later remained free from this trouble and developed no internal breakdown until 17th July.

Two cover sprays were found by O. Butler and S. Dunn to be essential for the protection of McIntosh apples from scab [*Venturia inaequalis*], whereas one suffices in the case of the less susceptible Baldwin. In this year's experiments with cal-mo-sul [ibid., xiii, pp. 310, 358] 1 in 50, followed by flotation sulphur from the calyx application onwards, satisfactory control was obtained, but under conditions of heavy infestation the former has given very disappointing results. The data so far secured indicate that, under New Hampshire conditions, the ascospores ripen during the last ten days of April and are ejected in the course of the next wetting rain, irrespective of the length of the snow cover or mean temperature of the preceding winter.

In O. Butler's experiments mosaic potatoes grown at a mean temperature of 20° outyielded those cultivated at 15°. The earliest appearance of mosaic symptoms ranged from 2 to 12 days after emergence. To date no tendency to run out has been exhibited by mosaic plants grown at either temperature continuously or alternately. Leaf roll plants, on the other hand, show a marked falling-off in productivity when grown continuously or alternatively at both temperatures, and more especially when removed from the higher to the lower. Seed-piece decay in leaf roll plants at 15° and 20° amounted to 7·7 and 50 per cent., respectively.

K. W. Woodward's observations on timber preservation from 1929 to 1934 showed 75 per cent. decay in untreated white pine fence posts and 11 per cent. in those given the brush treatment [ibid., xii, p. 1], while open-tank and pressure creosoting and the zinc m[eta] arsenic method [ibid., xiv, p. 667] gave complete control of rotting.

Botany and plant pathology section.—*Rep. Ia agric. Exp. Sta., 1934–35*, pp. 67–89, 3 figs., 1935. [Received May, 1936.]

In further work by J. J. Wilson at Iowa in 1934 on the production of watermelon varieties resistant to wilt [*Fusarium bulbigenum* var. *niveum*: *R.A.M.*, xiv, p. 220; xv, p. 276, and below, p. 553], sufficient seed of two resistant varieties 'Iowa Dixie' and 'Improved Pride of Muscatine' was produced to plant 8 and 6 acres, respectively, in 1935; the latter is a new segregate unrelated to the former K–S4 (Pride of Muscatine) and isolated from Kleckley Sweet.

Experiments by H. C. Murphy showed that winter oat varieties and selections infected with crown and stem rust [*Puccinia lolii* and *P. graminis*, respectively: ibid., xiv, p. 220, and below, p. 492] were more susceptible to injury from artificially produced low temperatures than similarly hardened rust-free plants; it was invariably possible to select an exposure fatal to all infected plants of a particular variety or selection which would yet allow the complete survival of rust-free plants. The heavier the infection the greater was the susceptibility to injury. Shading before freezing reduced resistance to freezing injury in much the same way as did rust infection.

In studies by C. S. Reddy, made to find a potato seed-piece treatment effective against scab [*Actinomyces scabies*] and black scurf [*Corticium solani*], acidulated mercuric chloride, new improved semesan bel, A dust, and C dip gave, respectively, marketable increases in yield of 2·2, 17·2, 17·5, and 19·1 per cent.

W. J. Henderson found that the best control of sugar beet leaf spot [*Cercospora beticola*: ibid., xv, p. 337] was obtained in plots with a spacing of 28 by 28 in. Tests by C. S. Reddy again demonstrated that 5 per cent. ethyl mercuric phosphate at the rates of $\frac{1}{4}$ and $\frac{1}{2}$ lb. per 100 lb. sugar beet seed effectively inhibited damping-off. In 11 sugar beet fields areas with acid soil again had poorer stands than areas with neutral soil. On acid soil the principal cause of damping-off was *Pythium de Baryanum* [loc. cit.], the seed-borne *Phoma betae* [ibid., xv, p. 415, and below, p. 550] playing a minor part; the role of *Rhizoctonia* sp. is probably not appreciable in the field.

G. L. McNew reports that severe losses were sustained in nurseries owing to bulb rot of *Lilium auratum* caused by *Rhizopus necans* [ibid., x, pp. 668, 777].

Investigations by I. E. Melhus and W. J. Henderson showed that some lines of Red Globe onions possess 60 to 70 per cent. tolerance to pink root [*Phoma terrestris*: ibid., xiii, p. 558; xiv, p. 150]. A selection of the Yellow Globe variety made in 1931, open-pollinated and mass-selected, shows promise of resistance. A selected strain of the Riverside Sweet Spanish onion variety is highly resistant to yellow dwarf [ibid., xiv, p. 810].

G. L. McNew found that cedar-apple rust (*Gymnosporangium juni-*

peri-virginianae) [see above, p. 484] from some parts of Iowa did not infect the leaves of Turley apples, whereas cultures from other localities produced the usual chlorotic spot on this variety, on which also two cultures gave a spreading type of chlorosis followed by necrosis and defoliation. Apparently five physiological forms may be segregated on the aecidial hosts.

Observations by C. S. Reddy showed that the barley variety most resistant to scab [*Gibberella saubinetii*: ibid., xiv, p. 149] in Iowa is Peatland, followed by Bonami and OAC 21. Immunization studies made by G. N. Davis and R. H. Porter with barley seed infected with *G. saubinetii* showed that germination of such seed may be materially increased by twelve hours' pre-soaking in filtrates from cultures of *G. saubinetii*, *Fusarium moniliforme* [*G. moniliformis*], *Diplodia zeae*, *Aspergillus niger*, and *Helminthosporium gramineum*. Higher percentages of germination resulted when the seeds were treated with the filtrate from a fungus other than the one against which they were being immunized. Disease-free seed so treated was with one exception reduced in viability.

Bitancourt (A. A.), Gonçalves (R. D.), & Carneiro (J. G.). **Relação das doenças e fungos parasitas observados na secçao de phytopathologia durante os annos 1933 e 1934.** [Report on the diseases and parasitic fungi observed in the section of phytopathology during the years 1933 and 1934.]—*Arch. Inst. biol. Def. agric. anim., S. Paulo*, vi, pp. 206–211, 1935. [Received June, 1936.]

Among other items of interest in this summary of the diseases found affecting cultivated plants in San Paulo, Brazil, during 1933 and 1934 [cf. *R.A.M.*, xiii, p. 618] the following may be mentioned. Bananas were attacked by leaf spot (*Leptosphaeria musarum*) [ibid., xii, p. 458], sooty mould (*Chaetothyrina musarum*) on [Giant] Fig fruits, and storage rot due in part to *Stachylidium theobromae* [ibid., xiv, p. 427]. Avocado pears suffered from a fruit rot caused by *Acrostalagmus cinnabarinus*. A species of *Pestalozzia* was isolated from lesions on branches of the same host and induced similar symptoms as a result of inoculation experiments. Beets were affected by curly top [ibid., xi, p. 562; xv, p. 418].

Stempell (W.), Romberg (G. v.), & Ulpts (R.). **Über erfolgreiche Behandlung von Pflanzentumoren mit Organismenstrahlung aussendenden Mückenlarven.** [On the successful treatment of plant tumours with gnat larvae emitting organic radiation.]—*Biol. Zbl.*, lvi, 3–4, pp. 114–116, 1 fig., 1936.

Pelargonium zonale plants inoculated with *Bacterium tumefaciens* [*R.A.M.*, xv, p. 206] were afterwards subjected to irradiation by larvae of *Corethra plumicornis* (enclosed in a celluloid capsule) for periods up to 20 hours, with the result that, during the three months covered by the tests, tumour formation was greatly retarded and in 25 per cent. of the plants completely suppressed. All the inoculated plants not so treated developed well-marked tumours within a month.

WINKELMANN (A.). **Fortlaufend arbeitender Kurznassbeizapparat 'Primator' System Stümpfig der Firma Gustav Drescher, Halle (Saale).** [Continuously working short liquid disinfection apparatus 'Primator' (Stümpfig system) supplied by the firm of Gustav Drescher, Halle (Saale).]—*Tech. in d. Landw.*, xvii, 3, pp. 19–20, 1 fig., 1 diag., 1936.

On the basis of official tests at the Biological Institute, the Primator short disinfection apparatus [cf. *R.A.M.*, xiv, p. 501], supplied by G. Drescher, Halle, was found eminently suitable for the treatment of cereal and other seeds (e.g., flax and beet), the steeping solution being adequately utilized and the construction of the machine technically satisfactory. Its cost is M.390 and its capacity ranges from 300 to 1,200 kg. of seed.

BEVIN (R. H.). **Cereal smuts and their control.**—*Tasm. J. Agric.*, N.S., vii, 1, pp. 25–32, 2 figs., 1936.

The author gives short popular notes on the life-histories and control of bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*], loose smut (*Ustilago tritici*), and flag smut (*Urocystis tritici*) of wheat [*R.A.M.*, xv, p. 208], the last-named of minor importance in Tasmania, loose and covered smuts of oats (*Ustilago avenae* and *U. levis* [*U. kolleri*]), and loose and covered smuts of barley (*U. nuda* and *U. hordei*).

NICOLAS (G.). **Attaque intense et très précoce de l'Orge à deux rangs par Puccinia glumarum, parasité à son tour par un Darluca.** [An intense and very early attack on two-rowed Barley by *Puccinia glumarum*, parasitized in its turn by a *Darluca*.]—*C.R. Soc. Biol., Paris*, cxxi, 9, pp. 799–801, 1936.

The author records the occurrence in February, 1935, of *Darluca filum* [*R.A.M.*, xv, p. 74] heavily parasitizing the uredosori of *Puccinia glumarum* attacking self-sown two-rowed barley (*Hordeum distichum nutans*) in France.

NEWTON (MARGARET) & JOHNSTON (T.). **Stripe rust, Puccinia glumarum, in Canada.**—*Canad. J. Res.*, xiv, 2, pp. 98–108, 1 fig., 1936.

In Canada *Puccinia glumarum* is confined to British Columbia, Alberta, and the western half of Saskatchewan [*R.A.M.*, xii, p. 83]. The gradual diminution in the prevalence of the fungus in the easterly parts of the prairie provinces is probably associated with climatic conditions, the high day temperatures prevailling doubtless preventing the growth of the fungus during summer. Good germination of the uredospores was only secured between 5° and 18° C., the optimum for germination being 10° to 12° and for rust development 13° to 16°. Greenhouse experiments demonstrated that a temperature of 25° for 10 to 12 hours each day rendered a susceptible host plant resistant, and it is probable that even if the fungus were able to germinate in summer conditions, the high day temperatures common in the prairies in summer would induce resistance in the host plants. The rust becomes prevalent in Alberta only in autumn, spread coinciding with the shortening of the day and the reduction in the day temperature. It is unable to penetrate

very far eastwards before the end of autumn and it is unlikely the rust will ever become thoroughly established in Manitoba and Saskatchewan.

The natural hosts of *P. glumarum* include native grasses, particularly *Hordeum jubatum*, and species of *Agropyron*, *Elymus*, and *Bromus*. When taken from these hosts the rust was found capable of attacking wheat in all cases. Furthermore, forms 4, 6, 8, and 13 are able to attack seedlings of *Hordeum*, *Agropyron*, and *Elymus* and the authors therefore doubt the existence of Eriksson's five specialized varieties of the fungus [ibid., xv, p. 143]. All Canadian collections of the rust were identified as forms 8 or 13, the latter being by far the more common.

HANNA (W. F.). **Effect of vernalization on the incidence of loose smut in Wheat.**—*Sci. Agric.*, xvi, 7, pp. 404–407, 1936. [French summary.]

After a brief reference to the literature dealing with the effect of environmental conditions on the incidence and development of loose smut of wheat [*Ustilago tritici*], the author states that vernalization of Marquis seed-grain, artificially inoculated with the smut, did not appreciably affect the incidence of the disease in tests which were carried out in 1934 at Winnipeg.

BAMBERG (R. H.). **Black chaff disease of Wheat.**—*J. agric. Res.*, lii, 6, pp. 397–417, 1936.

This is a full account of the author's investigations on the black chaff disease of wheat (*Bacterium translucens var. undulosum*), a preliminary report on which has been noticed from another source [*R.A.M.*, xi, p. 434]. In addition to the information already imparted, it is stated that in Minnesota the disease usually does not appear until wheat is headed out and approaching maturity; seedlings are rarely infected. Some varieties are often attacked at the lower nodes of the culms, whereas in others the infection is usually limited to the heads and the necks of the culms. In addition to the hosts previously listed, einkorn wheat has also been found to be susceptible to black chaff. The organism was shown to be resistant to extremely low temperatures, remaining viable in soil cultures placed outdoors for at least 124 days after the middle of December. The existence was established of strains of the bacterium, which differed in their cultural and physiological characters, as well as in pathogenicity. Considerable variations were also noticed in the relative susceptibility of different varieties of wheat to black chaff, field observations over a number of years indicating that Marquis, Mindum, and Kubanka are resistant, and Hope, H–44, and Kota very susceptible.

BLAIR (I. D.). **The foot-rot disease of Wheat.**—*N.Z.J. Agric.*, lii, 3, pp. 129–137, 3 figs., 1936.

Wheat in the Canterbury area of New Zealand is stated to be severely attacked by foot rot, the principal causal organism of which was identified as *Fusarium culmorum* [*R.A.M.*, xv, p. 428]. The disease develops throughout the growing season, the first noticeable symptom being a seedling blight, which commonly accounts for 10 per cent. of the field stands, while the losses in some fields may be as high as 46 per cent. In the early spring the trouble manifests itself in the form of

backward, yellowish, tip-withered plants, which may either be scattered or the whole crop may be affected; the hypocotyl of the diseased plants usually rots away, but adventitious roots may develop above the lesion and allow the plant to survive. Other conditions associated with the disease are whiteheads and wheat scab.

Surveys of over 100 wheat fields indicated that foot rot may develop after any crop included in rotation schemes, and that growing wheat for two or three consecutive years on one area does not appear to increase the percentage infection. Seedling blight was always high in fields heavily infested with *Agropyron repens*, the rhizomes of which were shown to carry pathogenic forms of *Fusarium*. Perennial rye grass [*Lolium perenne*] sown after wheat badly affected with seedling blight showed patches of stunted plants, carrying *Fusarium* on the underground parts. Foot rot appeared to be more serious on heavy wheat land than on lighter soils. In one experiment, in which non-manured rows of Tuscan wheat were intercalated between manured rows, the former were distinctly more affected by seedling blight than the latter. Soil acidity was found to be directly correlated with the severity of seedling blight.

Control should be directed towards affording the wheat plant favourable conditions for its development, among which the preparation of a firm seed-bed and avoiding sowing too late in the season, i.e., in very cold soils, are specially recommended. Top-dressing in the spring tends to minimize the trouble.

PADWICK (G. W.). **A growth factor influencing the development of Ophiobolus graminis Sacc.**—*Sci. Agric.*, xvi, 7, pp. 365–372, 1936. [French summary.]

Continued experiments with *Ophiobolus graminis* [*R.A.M.*, xiv, p. 622] showed that the growth of the fungus, which is unable to develop in a number of common synthetic solutions in the absence of certain plant or animal extracts, was greatly activated in a standard synthetic solution by the addition of 7·5, 15, or 30 c.c. per l. of an aqueous extract of carrots, from which the proteins, and the ether- and acetone-soluble fractions had been removed, as well as much of the sugar; this extract provided very little sugar and a small quantity of nitrogen. A growth-stimulating effect was also exerted by casein aqueous extract deprived of its proteins and of its ether-soluble fraction. Further experiments are required to determine whether the growth-promoting factor present in these extracts is identical with the second growth factor found by Buston and his collaborators to be necessary for *Nematospora gossypii* (*Biochem. J.*, xxv, 5, pp. 1656–1673, 1931; xxvii, 6, pp. 1859–1868, 1933). In the experiments a strain of bacteria was found, which also stimulated the growth of *O. graminis* in synthetic solutions. It is believed that the growth factors probably play an important part in maintaining the balance of micro-organisms in field soils.

PADWICK (G. W.). **Biologic strains of Ophiobolus graminis Sacc.**—*Ann. appl. Biol.*, xxiii, 1, pp. 45–56, 2 graphs, 1936.

A comparative study of 14 isolates of *Ophiobolus graminis* [see

preceding abstract] obtained from wheat, *Agropyron tenerum*, *A. repens*, and *Hordeum murinum* in England, Canada, and Australia showed that the optimum growth temperature for all of them on carrot dextrose agar was in the neighbourhood of 25° C., though they varied in their ability to grow at temperatures above and below this, some growing at both 12° and 30°, whereas others were inactive at these temperatures, and none grew at 36°. They varied also in type of growth on this medium, chiefly in the production of macrohyphae which were not formed by any strain on plain agar. Saltation was observed, leading to the abundant production of black macrohyphae by a culture (isolated from *A. repens*) normally producing very few. Marked differences were shown in ability to survive desiccation (over calcium chloride or 60 per cent. sulphuric acid), which appeared to be related to the presence of macrohyphae. Studies on differential host reaction, using several isolates and Red Fife, Little Joss, Reward, and Squarehead wheat varieties, Plumage Archer barley, *Triticum monococcum*, *T. dicoccum*, and *T. spelta*, showed that the isolates that caused most injury to any one host caused most injury to the rest, the converse being also true, i.e., hosts most resistant to one isolate were also those most resistant to the rest. None of the varieties used, however, showed any marked degree of resistance. The different isolates varied widely in pathogenicity, but no specificity was exhibited to any of the hosts used.

LEDINGHAM (G. A.). **Rhizophidium graminis n.sp., a parasite of Wheat roots.**—*Canad. J. Res.*, xiv, 3, pp. 117–121, 1 pl. 1936.

A brief morphological and biological account is given of a hitherto undescribed species of *Rhizophidium* [*R.A.M.*, viii, p. 571] found in 1930 growing on living roots of wheat in Ottawa, Canada, and in 1932 on living roots of a *Panicum* sp. in Boston, Massachusetts, and for which the name *R. graminis* is proposed [with a Latin diagnosis]. This is stated to be the first known record of a member of this genus on higher plants. In Ottawa the infection of the wheat roots was in general light and very scattered, but in certain specimens the parasite was very plentiful. Attempts to isolate the fungus were unsuccessful.

R. graminis is characterized by smooth-walled, globose to ellipsoid, solitary or gregarious zoosporangia, 10 to 75 μ in diameter, producing at their base fine rhizoids which ramify within the host cell. The zoospores are ejected by the sudden bursting of the sporangium, the cup-shaped basal wall of which persists several days. The active zoospores are usually piriform, with one polar cilium 10 to 12 μ in length, and measure on the average 3 by 1·8 μ. The resting spores are globose, with a smooth endospore and a rough exospore wall and oily protoplasmic contents, and are 6 to 12 μ in diameter. Nuclear transfers occur through the rhizoids of two thalli. Germination of the resting spore is effected by the extrusion of the cell contents to form a thin-walled sporangium. Histological studies indicated that in wheat roots infection was initiated by the zoospores attaching themselves to a root hair or an epidermal cell of the root, and each developing directly into a zoosporangium; the rhizoidal system originates as an outgrowth from the zoospore without the formation of a subsporangial vesicle.

Johnston (C. O.). **Reaction of certain varieties and species of the genus Hordeum to leaf rust of Wheat, Puccinia triticina.**—*Phytopathology*, xxvi, 3, pp. 235–245, 1 fig., 1936.

Details are given of the writer's greenhouse experiments, covering a period of six years at Manhattan, Kansas, on the reaction of a number of cultivated varieties and wild species of barley to physiologic forms 1, 2, 5, 9, 15, and 35 of *Puccinia triticina* [*R.A.M.*, xiv, pp. 225, 299; xv, p. 83].

While none of the cultivated forms proved to be completely susceptible to the rust, several were more so than the wheat variety Democrat, e.g., three types of *Hordeum intermedium cornutum* (barley wheat) and Black Hull-less (*H. vulgare coeleste violaceum*). Jet (*H. deficiens nigrinudum*) was only moderately resistant to form 9 and was slightly susceptible to 15 and 33. Oderbrucker (*H. vulgare pallidum*) was very mildly infected by forms 5 and 33, Abyssinia (*H. deficiens steudelii*) by 5, 9, 15, and 33, and Steudelii (same group) by 1, 5, 9, and 33. Even the most susceptible of these cultivated barleys did not succumb to the disease so completely as the Malakoff and Mediterranean wheat varieties in response to some of the forms, but they did approximate to Hussar in their reactions to 9, 15, and 33, and were more susceptible than any of these wheats to form 1. The copious production of small uredosori on the susceptible cultivated barley varieties, as well as the wild species mentioned below, may possibly assist in the propagation of *P. triticina*. In general, greater differences in reaction to the rust were exhibited when several varieties or strains were inoculated with a single physiologic form than when one was infected by several different physiologic forms.

Among the wild species *H. gussoneanum* C.I. 6067 (from California) presented the nearest approach to susceptibility in tests with forms 5, 9, and 15, followed by *H. spontaneum*, *H. maritimum*, *H. bulbosum* [ibid., xii, p. 274], and an Idaho strain of *H. murinum*.

The majority of the barley varieties and species manifesting susceptibility to *P. triticina* were found to belong to the 14- and 28-chromose groups—a condition opposed to that observed in wheat, the resistant varieties of which are mostly found among groups with the lower chromosome numbers and the highly susceptible in the *vulgare* group with 42 chromosomes [cf. ibid., xv, p. 352].

Murphy (H. C.). **Effect of crown rust on the composition of Oats.**—*Phytopathology*, xxvi, 3, pp. 220–234, 1 fig., 1936.

In this full account of the study in Iowa of crown rust of oats (*Puccinia coronata avenae*) [*P. lolii*: *R.A.M.*, xiv, pp. 353, 567, 625] it is stated that infection initiated in the anthesis stage on the susceptible Markton variety and in the seedling, boot, and anthesis stages on the resistant Victoria, did not appreciably influence the amounts of moisture, ash, fat, and fibre in the kernels. There was, however, a slight increase in the crude protein content of infected plants and a corresponding decline in nitrogen-free extract. The green weight of diseased plants of Markton and Iogold (susceptible) and of Victoria and Bond (nearly immune) was 69·3, 63·6, 22·2, and 14·7 per cent.,

respectively, lower than that of healthy ones. Concentrations of insoluble solids, ash, nitrogen, and acid-hydrolysable substances in the green plant were all increased by rust infection, especially ammonia, amide, and nitrate and nitrite nitrogen. In the susceptible Markton variety the increases in these non-colloidal nitrogen fractions amounted to 257·1, 327·3, and 322 per cent., respectively, compared with a maximum increase of 25·8 per cent. for colloidal or protein nitrogen and of 29·6 and 29·7 per cent., respectively, for insoluble solids and acid-hydrolysable substances. Infection by *P. lolii* caused a decrease in the sucrose, glucose, and levulose contents of 83·6, 78·7, and 97·4 per cent., respectively, in Markton, the corresponding figure for total solids and dextrin being 19·3 and 23·3 per cent., respectively.

HOLTON (C. S.). **Origin and production of morphologic and pathogenic strains of the Oat smut fungi by mutation and hybridization.**—*J. agric. Res.*, lii, 4, pp. 311–317, 1 diag., 1936.

A brief account is given of the author's continued studies on the oat smuts (*Ustilago levis* [*U. kolleri*] and *U. avenae*) [*R.A.M.*, xii, p. 622 *et passim*], in which he claims to have established that the new buff type of oat smut [loc. cit.] is the result of mutation in *U. kolleri*, which it resembles except that its chlamydospores are hyaline instead of brown. Evidence is presented, indicating that the change in the colour factor occurred during meiosis in a germinating chlamydospore, one of the four haploid nuclei losing the factor for brownness. It is suggested that the factors for sex and chlamydospore colour segregate independently of each other. In hybridization experiments, a new pathogenic strain of *U. kolleri* was obtained by crossing a Gothland strain of *U. avenae* with a Monarch strain of *U. kolleri*, which in the F_3 generation proved to be almost as virulent on Gothland as the *U. avenae* parent, but somewhat less so on Monarch than the *U. kolleri* parent. Crossing a buff smut strain from Monarch wheat with the Gothland strain of *U. avenae* also gave a new strain of the former, which in the F_3 generation was equally virulent on Gothland with the *U. avenae* parent but less so on Monarch than the buff smut progenitor.

ARND (T.) & SEGEBERG (H.). **Über das Wasserverbindungsvermögen des Torfes und dessen Zusammenhang mit den sog. Bodenkrankheiten (Urbarmachungskrankheit u. a.).** [On the water-binding capacity of peat and its connexion with the so-called soil diseases (reclamation disease, &c.).]—*Z. PflErnähr. Düng.*, A, xliii, 3–4, pp. 134–142, 3 graphs, 1936.

The consensus of opinion among workers on the reclamation disease of cultivated plants [*R.A.M.*, xv, p. 461] is that the bog soils on which it is most liable to occur are typically structureless, evidently because the colloids in such soils exert a binding action under moist conditions, with the result that on drying out, the capillaries close and the underground water is unable to rise to the surface. This would explain Hudig's observation (*Z. PflErnähr. Düng.*, viii, p. 14) that the disorder sometimes appears in the course of a few hours on hot summer days, when its symptoms closely resemble those of heat or frost injury. The copper sulphate commonly applied for the control of reclamation

disease, being an electrolyte, acts as a coagulant and converts the fixed capillary system into a movable one. When the soil dries out, the capillaries remain open and permit the passage of the underground water to the surface, where it replenishes the moisture lost by evaporation. Another remedial effect of copper sulphate consists in the formation of copper humate which covers both the inner and outer surfaces of the soil particles and facilitates irrigation.

Although definite proof of the truth of this working hypothesis is still lacking, the authors' preliminary experiments [technical details of which are given] on sphagnum peat at the Prussian Bog Experiment Station, Bremen, suggest that it may well be accepted as a basis for further investigations.

Böning (K.) & Wallner (F.). **Welke, Fusskrankheit und andere Schädingungen an Mais durch Colletotrichum graminicolum (Ces.) Wilson.** [Wilt, foot rot, and other damage to Maize caused by *Colletotrichum graminicolum* (Ces.) Wilson.]—*Phytopath. Z.*, ix, 1, pp. 99–110, 7 figs., 1936.

During the summer of 1935 yellow Baden maize at the Bavarian Agricultural and Plant Protection Institute was severely affected by a hitherto undescribed wilt and foot rot, the agent of which was isolated in pure culture and identified as *Colletotrichum graminicolum* [*R.A.M.*, xv, p. 280]. The fungus [which is described in detail] was shown to be seed-borne, infected seed being marked by black spots or streaks on the surface. Inoculations of seed, of both seed and seedling, and of soil gave positive results (73, 71, and 58 per cent., respectively). The taxonomy of *C. graminicolum* and its distribution on other hosts are discussed. In addition to the synonyms listed by Wilson (*Phytopathology*, iv, [p. 106], 1914), the following are considered to be identical with *C. graminicolum*: *Vermicularia graminicola*, *V. affinis*, *V. culmifraga*, *V. graminum*, *V. relicina*, *V. bohlenae*, *V. melicae*, *V. graminella* [*R.A.M.*, viii, p. 290], and, judging from the diagnoses, *C. lolii* (Fautr.) Zimm., *C. vermicularia*, *C. jaczewskii*, and *C. andropogonis* [ibid., vii, pp. 231, 711].

Koehler (B.). **Entry of Fusarium moniliforme and Cephalosporium acremonium into growing Corn ears.**—Abs. in *Phytopathology*, xxvi, 2, pp. 98–99, 1936.

Apparently sound ears of dent maize were dissected in five stages of development, and parts plated. In the 500 ears plated, the possibility of the entry of fungi through the shank was almost entirely excluded. *Fusarium moniliforme* [*Gibberella moniliformis*: *R.A.M.*, xv, p. 289] penetrated all infected ears through the tip, passed downward along the silks, inward along the kernel surfaces, then along the bracts and pedicels, and finally reached the vascular cylinder of the cob in 8 per cent. of the ears in the milk stage and in 46 per cent. of mature ones. *Cephalosporium acremonium* [ibid., xiii, p. 572] was detected almost as frequently as *G. moniliformis* in the ears well protected by husks and free from worms, but its incidence was not greatly augmented by injury at the tip. Its path of entry was also the same in at least 90 per cent. of the diseased ears.

CAMP (A. F.) & REUTHER (W.). **Progress in zinc sulfate studies.**—*Proc. Fla hort. Soc., 1935*, pp. 59–61 [? 1935. Abs. in *Chem. Abstr.*, xxx, 9, p. 3152, 1936.]

Zinc sulphate sprays were found to give the best control of frenching or mottle leaf of citrus in Florida [*R.A.M.*, xiv, p. 441; cf. also xv, p. 363] when applied from 1st February to 1st July. The spray should be composed of zinc sulphate (89 per cent.) 5 lb. and high-grade hydrated lime 2½ lb. per 50 to 100 galls. water. Lime-sulphur may be added if desired. Excessive precipitation of sulphur occurs when zinc sulphate is added to lime-sulphur without hydrated lime. On severely frenched trees the fruit is small, hard, with a low juice and a very low acid content, both of which are materially increased by the use of zinc sulphate sprays.

FERNANDES E SILVA (R.). **A podridão preta e a podridão peduncular dos Citrus.** [Black rot and stem-end rot of Citrus.]—*Bol. Minist. Agric. Rio de J.*, xxiv, 10–12, pp. 13-24, 4 figs., 1935. [Received April, 1936.]

Both black rot (*Diplodia natalensis*) and stem-end rot (*D. natalensis* and *Phomopsis* [*Diaporthe*] *citri*) [*R.A.M.*, xv, p. 212] having been found to occur on citrus fruits in Brazil, the writer summarizes some outstanding work on these diseases and their control by various well-known American phytopathologists.

LEONARD (E. R.). **The storage of Trinidad Citrus fruits.**—*Mem. Low Temp. Res. Sta., Trin.*, 2, 47 pp., 11 graphs, 4 diags., 1936.

In this preliminary account of investigations in Trinidad into the storage behaviour of grapefruit and oranges it is stated that fungal wastage of grapefruit between picking and cold storage was low and due almost entirely to *Botryodiplodia theobromae* [*R.A.M.*, xiv, p. 754]. In trials at 40° F. no wastage occurred during 20 days in quailed and 30 days in unquailed grapefruit, but on transference to a higher temperature the chill blemishes afforded points of infection and occasioned wastage in excess of that observed in fruit originally stored at 53°. At 45° *B. theobromae* appeared early during storage, *Penicillium digitatum* [loc. cit., xv, p. 363] showed a steady increase, and *Colletotrichum gloeosporioides* [see next abstract] seldom developed until after 50 days. At 53° considerable wastage took place, chiefly caused by *B. theobromae* and *C. gloeosporioides*. During distribution the incidence of wastage varied considerably, even from crate to crate.

For most of the season wastage in grapefruit from the packing-sheds was confined to *B. theobromae*, *C. gloeosporioides*, *P. digitatum*, and *P. italicum*, but in earlier consignments received direct from the plantations *Dothiorella* [*Botryosphaeria*] *ribis* [ibid., xiii, p. 249; xv, p. 238], *Oospora* sp., *Fusarium lateritium* var. *fructigenum* [*F. lateritium*], *Eidamia* sp., and *Aspergillus niger* also occurred. *P. digitatum* was scarce in the early trials but tended to become the commonest rot in mid-season, whereas *C. gloeosporioides* tended to decrease throughout the season.

A storage trial with Cocoa oranges at 45° showed the extreme importance of reducing the quailing period to a minimum, the total

fungal wastage developing during quailing, storage, and distribution amounting to 37·5 per cent. in fruit quailed 10 days and only 7·5 per cent. in that quailed 2 days, the fungi involved being *B. theobromae*, *P. digitatum*, and *P. italicum*. Indications of chilling injury are not so marked as in grapefruit, but the presence of numerous primary and secondary fungi, including *Phomopsis* [*Diaporthe*] *citri* [see preceding abstract] and *C. gloeosporioides*, indicated that the resistance of the fruits to infection had decreased as a result of low temperature injury.

In a trial with Valencia oranges, no fungal wastage occurred in storage for 30 days in quailed or for 38 days in unquailed fruit at 40°, 45°, and 53° whilst wastage during distribution amounted to 39, 24, and 51 per cent., respectively in quailed fruit and 67, 18, and 36 per cent. in the unquailed. In King oranges stored at 45° and 50° fungal wastage was negligible and with Satsuma oranges stored at 40°, *P. digitatum* caused 4·3 per cent. wastage.

CHAUDHURI (H.). **Diseases of Citrus in the Punjab.**—*Indian J. agric. Sci.*, vi, 1, pp. 73–109, 8 pl. (4 col.), 1 map, 1936.

In the Punjab citrus wither-tip (*Colletotrichum gloeosporioides*) [*R.A.M.*, xii, p. 369; xv, pp. 361, 364] occurs in an epidemic form in many localities on *Citrus poonensis* (an orange of the mandarin type known locally as 'santara') and on 'malta' orange (*C. sinensis*). Orchards situated at the foot of the hills suffer most. Great loss is caused by the dropping-off of immature fruits, while young plants may be killed outright.

Several strains of the fungus differing in spore measurements, permanent growth characters, and virulence have now been isolated; different sex characters were shown by the different monosporous cultures, and when two cultures were grown together complete fusion was shown in some cases, while in others a space or a white line developed between them. No fruit bodies were formed.

Successful inoculations of healthy plants were effected with *C. gloeosporioides*, but evidence was obtained that some of the severest injuries associated with the disease may be due to infection by the fungus in association with others. Unfavourable soil and climatic conditions or injury by hail are contributory factors favouring the growth of the parasite. The susceptible Blood Red variety of the 'malta' orange was found to be somewhat resistant when grafted on 'kimb' stock, the Valentine variety of malta orange remaining unaffected when grafted on Eureka lemon. Only plants on 'khatta' [*Citrus aurantium*] stocks developed typical wither-tip.

In the Punjab, citrus chlorosis [ibid., i, p. 216; xiv, pp. 561, 753] is characterized by a leaf mottle and early defoliation. Spraying with ferrous sulphate 0·0001 per cent. solution twice a year was found to assist recovery.

Though not much damage is done to citrus leaves by sooty moulds, affected fruits acquire a bitter taste. Fungi commonly found associated with the condition were *Acrothecium lunatum* [*Curvularia lunata*: ibid., xiii, p. 475], *Capnodium citri* [ibid., xiii, p. 693], *Cladosporium herbarum* var. *citricola* [ibid., xi, p. 223], *Alternaria citri* [ibid., xiv, p. 628], *Chaetomium* sp., *Pleospora herbarum*, and

Aspergillus sp. *Alternaria citri* may also bring about the fall of immature fruits and cause a dry internal rot, entering the fruit either at the stylar or stem end. For the control of wither-tip and associated diseases Bordeaux mixture (5:5:50) was the most effective spray tested, especially when used with ferrous sulphate as a sticker. Against sooty moulds Bordeaux-oil emulsion, Bordeaux with rosin, and Bordeaux-rosin with nicotine sulphate gave excellent results. Manurial treatment improved the general condition of the plants, but did not prevent the development of wither-tip.

BROADLEY (E.). **Use of oil sprays in the control of sooty mould of Citrus fruits.**—*Hadar*, viii, pp. 84–85, 1935. [Abs. in *J. Soc. chem. Ind., Lond.*, lv, 24, p. 516, 1936.]

Both the sooty mould of citrus fruits (*Capnodium citri*) [see preceding abstract] and the wax scale (*Ceroplastes floridensis*) associated with it are stated to be controllable in Palestine by spraying with 2·5 per cent. oil emulsions.

TOMKINS (R. G.). **The micro-biology of fruit.**—*J. Soc. chem. Ind., Lond.*, lv, 11, pp. 66T–70T, 1936.

It is estimated that from 2 to 3 per cent. of the total imports into England of citrus fruit are lost through the green rot due to *Penicillium digitatum* [see above, p. 495]. The following counts of this organism were made in consignments of oranges from various countries (*a*) by shaking five pieces of skin 0·1 sq. cm. in area with water, adding this to malt agar, and counting the resulting colonies, and (*b*) by placing ten pieces of skin of the same size directly on the surface of nutrient agar and noting the fungal growth: South Africa, Eastern Province, (*a*) 10 and (*b*) 36 spores per sq. cm.; Northern Transvaal, (*a*) 22, (*b*) 4; Natal, (*a*) 15, (*b*) 24; Eastern Transvaal, (*a*) 8, (*b*) 18; Brazil, (*a*) 20, (*b*) 5; U.S.A., (*a*) 8, (*b*) 6; Spain, (*a*) 6 and 84, (*b*) 10 and 10. In comparison with these numbers the incidence of *P. italicum* was negligible (maximum 4 spores per sq. cm.).

The losses in South African lemons, oranges, and grapefruit after 19 days' storage amounted to 27, 10, and 4 per cent., respectively, when no spores were added, and to 50, 24, and 16 per cent., respectively, when the fruit was inoculated with *P. digitatum*. In experiments on the detection of fruit injuries by various stains, ferric chloride showed up relatively obvious damage, while thionin-blue (1 per cent. in 0·5 per cent. phenol) has given valuable indications in bringing out defects caused by grit and box rub. The susceptibility of oranges to green mould is increased by treating them with rising concentrations of hydrochloric acid followed by washing and inoculation.

The maximum temperature for the development of green mould is about 30° C., but storage at high temperatures is not a practical means of combating the disease owing to the adverse effect of heat on the flavour of the fruit. Control measures should be based on the reduction of the spore-load (by curtailing the period of wilting before packing and cleaning and disinfecting the lug boxes), careful handling to minimize the risk of wounding, and the retardation of rot development by storage at 40° F.

Ocfemia (G. O.), Manzo (I. C.), & Celino (M. S.). **The gum disease of Citrus occurring in the Philippines**—*Philipp. Agric.*, xxiv, 10, pp. 811–838, 8 figs., 1936.

After a brief reference to the literature dealing with the gumming disease of citrus in various parts of the world the authors give an account of their own investigations of the condition in the Philippine Islands, where it was found to be destructive in old and neglected plantings of the four important commercial varieties of *Citrus*, namely, Batangas mandarin (*C. nobilis*), sweet orange (*C. sinensis*), pomelo (*C. maxima*), and calamondin (*C. mitis*), in descending order of susceptibility. The disease chiefly affects the trunk and the larger limbs of the trees, but twigs and the fruit may also be attacked, infection being most severe at the base of the trunk within 1 m. from soil-level, where the lesions may girdle the trunk and eventually kill the tree. Citrus seedlings are also attacked and sometimes killed by the disease. The effects of the disease are more conspicuous during the dry season than in the rainy months.

Isolations from affected tissues consistently yielded *Fusarium solani* [ibid., xiii, p. 631], which was present in practically all the specimens examined and reproduced the disease when inoculated in pure culture through wounds [cf. loc. cit.]; it was not capable, however, of penetrating uninjured bark. Inoculations with the fungus on Batangas mandarin and sweet orange resulted in slight gum formation but extensive rotting, whereas on pomelo and calamondin the lesions were characterized by copious exudation of gum with slight rotting of the bark; slight callus formation was observed round the lesions in the three last-named hosts.

Besides *F. solani*, some of the diseased specimens contained a species of *Diplodia* which is tentatively referred to *D. natalensis* [ibid., xv, p. 364 and next abstract], and one yielded a species of *Hypomyces*, tentatively identified as *H. haematococcus* [*Nectria haematococca*: ibid., xiv, p. 742]. Both fungi were shown to be capable of producing a type of gum disease.

Limited trials showed that the disease may be controlled by cutting out infected bark down to the healthy wood, disinfecting the wounds with 1 in 1,000 mercuric chloride, and dressing them with coal-tar.

Brooks (C.) & McColloch (L. P.). **Some storage diseases of Grapefruit.**—*J. agric. Res.*, lii, 5, pp. 319–351, 6 pl. (1 col.), 3 figs., 1 graph, 1936.

A tabulated account is given of the authors' studies of the factors favouring the development in the grapefruit of the following storage troubles: pitting [*R.A.M.*, xi, p. 570], two forms of which are distinguished: 'definite' pitting, referring to pits 0·2 in. or more in diameter and depressed to a fairly uniform depth of about $\frac{1}{32}$ in., and 'mild' pitting, which is less pronounced than the former; scald [loc. cit.]; oleocellosis [ibid., xiv, p. 755]; browning of the oil cells; and watery breakdown of the fruit; the last-named is a low-temperature disease of rather common occurrence in fruit picked late in the season, in which the peel or flesh (more often both) becomes soft, spongy, and water-soaked, giving the fruit the appearance of having been frozen, and after

removal from storage the fruit develops a disagreeable odour of fermentation. Various bacterial forms were readily isolated from pitted tissue, some of which (and more particularly one, the characters of which are described) reproduced the pitting when inoculated into sound grapefruit peel; there was, however, collateral evidence indicating that the bacteria are not the primary cause of the condition. The development of both types of pitting was favoured by low humidities in storage. Definite pitting was much more severe at 36° and 40° F. than at 32°, while mild pitting was somewhat worse at the latter than at the former temperatures; both types were practically eliminated at 50°. Scald and watery breakdown were worse at 30° and 32° than at 36° and 40°. Pre-storage temperatures of 60° to 75° definitely decreased pitting in storage at 36°, and heating the fruit before storage for 17 to 22 hours at 100° resulted in a very considerable decrease of pitting at 36° or 40°, but in many cases gave a definite increase of pitting in fruit stored at 32°. Scald was much worse on heated fruit, especially on that stored at 32°. Practically none of the troubles developed in fruits which, after one or two weeks at lower temperatures, were permanently removed to 50°. Exposing grapefruit for 20 to 48 hours to atmospheres containing 20 to 45 per cent. carbon dioxide before low temperature storage resulted in a definite decrease in the subsequent development of pitting, the best results being obtained with the longer treatment and higher percentages of gas; the same amount of control was also obtained by storing the fruit in paraffin or cellophane [ibid., xiii, p. 694] wrappers, while excessively oiled wrappers gave even better control; the best control of pitting was given by coating the fruit with mixtures of mineral oil and wax, but this treatment sometimes caused an increase in scald and watery breakdown, especially in storage at 32°. Fruit stored at 50° soon developed a high percentage of stem-end rot [*Diplodia natalensis*: ibid., xi, p. 570; xv, p. 291], but fruit held at 40° or lower usually showed no decay at the end of eight weeks' storage.

VRIJDAGH (J. M.). **Contribution à l'étude de la maladie des chancres des tiges du Cotonnier.** [Contribution to the study of the Cotton stem canker disease.]—*Bull. agric. Congo belge*, xxvii, 1, pp. 3–37, 10 pl., 2 figs., 1936.

The results of the author's histological studies [details of which are given] of cotton stems affected with stem canker in the Belgian Congo, together with those of previous investigations [*R.A.M.*, xiii, p. 231], are stated to have shown conclusively that the condition is primarily due to the activities of the mosquito bugs *Helopeltis bergrothi* and *H. sanguineus*, without the co-operation of any micro-organism.

LEWIN (C. J.). **Agriculture in the Territory.**—*Rep. Dep. Agric. N. Rhod., 1935*, pp. 3–7, 1936.

The following item of phytopathological interest occurs in this report. Considering the vast scale of the return migration of the red locust (*Nomadacris septemfasciata*) during the latter part of 1934 and early 1935, hopper hatchings were unexpectedly small, probably largely on account of the infestation of the parent swarms by *Empusa grylli* [*R.A.M.*, xv, p. 216] and *Metarrhizium anisopliae* [ibid., xiv, pp. 429, 629].

Ciferri (R.). **Sulla posizione sistematica dell'Aegeritha duthiei, fungo dell' 'ambrosia' dei termitai.** [On the systematic position of *Aegerita duthiei*, the fungus of the 'ambrosia' of termites' nests.]—*Atti Ist. bot. Univ. Pavia*, Ser. IV, vi, pp. 229–246, 6 figs., 1935. [Latin and English summaries. Received April, 1936.]

After reviewing earlier studies on fungi attacking termites [cf. *R.A.M.*, xiv, p. 167] the author gives a full account of *Aegerita duthiei* [*R.A.M.*, v, p. 423] found in the nests of *Nasulitermes morio* in the Dominican Republic. Beside the whitish conidial stromata, ellipsoidal or ovate chlamydospores 6 to 12 by 5 to 10 μ are found. The conidiophores are swollen at the apex and bear chains (sometimes branched) of 2 to 7 conidia, which measure 6 to 18 by 4 to 15 μ, those nearer the centre being smaller and elliptical or cylindrical, the outer ones large and spherical. A few intercalary chlamydospores were obtained in culture with indications of clamp-connexions. As the author considers the genus *Aegerita* is characterized by solitary (never catenulate), monomorphous conidia, he transfers the species to a new genus *Termitosphaeria* as *T. duthiei* n. comb., a Latin diagnosis of the genus being given.

Moore (M.), Kile (R. L.), Engman (M. F.), & Engman (M. F.). **Pityrosporum ovale (bottle bacillus of Unna, spore of Malassez). Cultivation and possible role in seborrheic dermatitis.**—*Arch. Derm. Syph., Chicago*, xxxiii, 3, pp. 457–472, 7 figs., 1936.

In the horny layer of tissue and hair follicles of persons suffering from seborrhoeic dermatitis the fungus *Pityrosporum ovale* [*R.A.M.*, xii, p. 442; xiv, p. 696] commonly appears in the form of ovoid or spherical cells, 2 to 4 μ long, with some spherical, thick-walled structures up to 11 μ in diameter. In acute, rapidly spreading conditions, the cells are generally ovoid, 3 μ long, with small, flask-shaped buds. Contamination by saprophytic yeasts and fungi is very liable to confuse the clinical picture. In cultures on Difco wort agar the colour of the colonies ranges from pale ochraceous salmon to pinkish-buff. On different media the cells may either occur singly, in oidial chains, or in an elongated, sclerotic form. A condition simulating seborrhoeic dermatitis was induced in human patients, rabbits, and guinea-pigs by inoculation through excoriated areas of the skin and other methods.

De Cisneros (J. M. G. J.). **Il valore dei mezzi naturali per lo studio dei dermatofiti. II. I mezzi naturali vegetali, i loro derivati ed i mezzi batterici.** [The value of natural media for the study of dermatophytes. II. Natural plant media, their derivatives and media containing bacteria.]—*Atti Ist. bot. Univ. Pavia*, Ser. IV, vii, pp. 75–101, 9 figs., 1936. [Latin summary.]

The author describes an investigation carried out on 15 species of dermatophytes to test the validity of the view expressed by Langeron and Milochevitch [*R.A.M.*, ix, p. 781] that media containing polysaccharides and natural media are particularly favourable to the growth of these organisms. On wheat and barley seeds the best growth was shown by *Epidermophyton* [*Trichophyton*] *purpureum*, which produced

abundant red pigment; *Achorion schoenleini*, *Microsporon ferrugineum*, *T. acuminatum*, and *A. quinckeanum* grew well but slowly. *T. rosaceum* [ibid., xv, p. 219] and *M. audouini* grew very poorly, and on barley seed only. *T. violaceum* and *Endodermophyton* [*T.*] *indicum* [ibid., xiv, p. 308; xv, p. 152] showed practically no growth. Microscopically, the same characters were seen as on ordinary media. The mycelium was in all cases much less vigorously developed than on ordinary media and polymorphism rapidly set in.

Horse manure was strikingly unfavourable to growth except in the case of *A. gypseum*, *T. asteroides*, *T. cerebriforme*, and *T. acuminatum*, all the other fungi growing very poorly or not at all.

On wheat meal agar nearly all the organisms grew well and chlamydospore development was profuse. On dextrin agar and peptonized starch agar all the fungi except *A. gypseum*, *A. schoenleini*, and *E.* [*T.*] *niveum* [ibid., xiv, p. 218] made extremely poor, atypical growth.

From these results the author concludes that in the study of the dermatophytes natural media and media containing polysaccharides are only of very limited value and consequently the classification of the dermatophytes suggested by Langeron [ibid., x, p. 242] must be regarded as inadequate.

KROEMER (G.). **Über die bisher bekannten menschlichen Cephalosporium-Infektionen, nebst Untersuchungen über zwei verschiedene Stämme von Cephalosporium acremonium Corda.** [On the human *Cephalosporium* infections hitherto recognized, together with studies on two distinct strains of *Cephalosporium acremonium* Corda.]—*Z. Parasitenk.*, viii, 3, pp. 317–331, 8 figs., 1936.

The writer summarizes the literature on *Cephalosporium* infections of man [cf. *R.A.M.*, xv, p. 93] and discusses the propriety of Benedek's renaming of Grütz's species (*C. acremonium*) [ibid., xv, p. 220] as *C. asteroides griseum grützii* (cf. ibid., xiv, p. 405]. A comparative investigation of the strain isolated by Grütz with a culture of *C. acremonium* Corda from Baarn revealed a close agreement in respect of their morphological, cultural, and physiological characters, as well as in their pathogenicity to laboratory animals, while conclusive proof of identity is considered to be afforded by hyphal anastomosis between the two strains [cf. ibid., xiii, p. 768]. Grütz's species may therefore safely be referred to *C. acremonium*.

NIIZAWA (S.). **Ueber die Dermatomycosen bsd. Favus in dem Lehoshan, Dakushan, Tonrian und Supingai in 'Manchoukuo'.** [On the dermatomycoses, especially favus, in the Lehoshan, Dakushan, Tonrian, and Supingai districts of Manchukuo.]—*J. orient. Med.*, xxiv, 3, pp. 605–612, 2 pl., 10 figs., 1936. [Japanese, with German summary on p. 34.]

Clinical and microscopic studies are stated to have been made in connexion with 24 cases of favus in four administrative districts of Manchukuo, with the result that the agent of the trouble in all the patients was determined as *Grubyella schoenleini* var. *mongolica* [*Achorion schoenleini* var. *mongolica* (Hashimoto and Ota) Dodge: *R.A.M.*, vii, p. 170].

Ota (M.). **Étude morphologique et taxonomique sur quelques Dématiées arthrosporées, blastosporées et aleuriosporées, pathogènes pour l'homme.** [A morphological and taxonomic study of some Dematieae with arthrospores, blastospores, and aleuriospores, pathogenic to man.]—*C. R. Soc. Biol., Paris*, cxxi, 12, pp. 1187–1189, 1936.

The genus *Torula* Pers. has been interpreted by Langeron [*R.A.M.*, viii, p. 173] as including only black-pigmented, filamentous fungi capable of forming blastospores, e.g., *T. jeanselmei*. On the other hand, Castellani's *Cryptococcus* [or *Cladosporium*] *metaniger* [ibid., xii, p. 219] is not primarily a thallosporous, blastosporous fungus (although a few incipient blastospores have been observed in culture), but is characterized by well-developed, narrowly septate arthrospores, for which reason it should be referred to *Circinotrichum* Nees as *C. metaniger*. Recent inoculation tests with this organism on rabbits, guinea-pigs, and mice showed it to be pathogenic only to the last-named.

In 1934 a Japanese worker named Kanô isolated from verrucose facial lesions in a young woman a species of *Hormiscium* which he named *H. dermatitidis*. The fungus was shown by inoculations on animals to be the agent of the disease.

Glenospora graphii [ibid., ix, p. 782] is the type species of aleuriospore-forming Dematieae pathogenic to man and consequently the writer's reference of *G. albiciscans* [ibid., iv, p. 479], the cause of Nieuwenhuis's dermatosis (tinea albigena), to this genus is incorrect. In 1930 Nannizzi [apud Agostini] transferred the agent of tinea albigena to *Glenosporella* [ibid., x, p. 458], the distinction between which and *Aleurisma* Link appears to the writer dubious. Should the separation, however, be maintained, *Glenospora gammeli* [ibid., xiv, p. 100] should also be transferred to *Glenosporella*.

Acladium castellanii [ibid., xv, p. 20] is characterized by dark brown to subfuliginous thalli and should, therefore, be placed among the Dematieae under *Glenospora* rather than in its present position with the Mucedineae. Serious injuries developed in animals inoculated with this organism in recent tests.

Kurotchkin (T. J.). **Variation of colonial characters of certain yeast-like fungi.**—*Chin. med. J., Suppl.*, l, pp. 171–178, 2 pl., 1936.

The writer describes his cultural studies on four strains of *Monilia* [*Candida*] *bronchialis* [*R.A.M.*, xiv, p. 509], two each of *M.* [*C.*] *tropicalis*, *M.* [*C.*] *pinoyi* [ibid., xv, p. 439], and *M. guilliermondi* [ibid., xii, p. 568], and one of *M.* [*C.*] *psilosis* [ibid., xiv, p. 444], identified mainly on the basis of fermentation tests. With the exception of one strain of *C. bronchialis* and that of *C. psilosis*, both of which frequently formed rough colonies after 8 to 10 days, the smooth aspect of the whitish circular cultures on Sabouraud's glucose agar persisted indefinitely; repeated transplants from the rough and smooth colonies of the two strains showed each type to be unstable, the character for roughness presumably depending on some physical environmental factor. In further experiments it was ascertained that roughness could be induced at will in all the species used, except one strain of *C. tro-*

picalis, by the addition to the medium of 8 to 10 per cent. peptone [cf. ibid., xv, p. 294], which evidently stimulates the surface growth of the fungal colony.

Jordon (J. W.) & Weidman (F. D.). **Coccidioidal granuloma: comparison of the North and South American diseases with special reference to Paracoccidioides brasiliensis.**—*Arch. Derm. Syph., Chicago*, xxxiii, 1, pp. 31–47, 6 figs., 1936.

Coccidioides immitis [*R.A.M.*, xv, p. 221] is stated to be firmly established as the agent of most, if not all, of the cases of North American coccidioidal granuloma recorded up to the present, and is also known to have caused the disease in two South American (Argentine) patients. On the other hand, the numerous cases in Brazil of a disease hitherto regarded as coccidioidal granuloma are attributable to a radically different fungus, *Paracoccidioides brasiliensis* [ibid., xii, p. 234; xiv, p. 631], two strains of which were secured for comparison with *C. immitis*. Not only did the two organisms differ markedly in their morphological and cultural characters, but their effect on laboratory animals was divergent, *C. immitis* being extremely virulent while *P. brasiliensis* gave almost exclusively negative results in pathogenicity tests. In the writers' opinion, the disturbances occasioned by *P. brasiliensis* are not properly referable to coccidioidal granuloma but should be known as 'Almeida's disease'.

Mackinnon (J. E.). **Description d'une souche de Phialophora verrucosa Thaxter (Medlar, 1915) isolée du premier cas de dermatite verruqueuse observé en Uruguay.** [Description of a strain of *Phialophora verrucosa* Thaxter (Medlar, 1915) isolated from the first case of verrucose dermatitis observed in Uruguay.]—*Ann. Parasit. hum. comp.*, xiv, 1, pp. 78–84, 1 fig., 1936.

The author's further study of *Phialophora verrucosa* [*R.A.M.*, xiv, p. 509] showed that the form of the fungus found in the lesions is a round, ochraceous, thick-walled body up to 10 μ in diameter, multiplying by direct division and forming conglomerations of 20 to 30 bodies; false budding is sometimes seen. Some old cells have a thick wall and contain a thin-walled spore. On 4 per cent. glucose agar the fungus forms a black growth covered with a dark brown aerial mycelium with a greyish sheen, the colonies reaching $1\frac{1}{2}$ cm. in diameter and 3 to 5 mm. in height within 40 days; old cultures contain a dark brown, diffusible pigment. On Czapek's agar the only aerial mycelium is a small central tuft and the colonies are dark brown, with no diffusible pigment. The hyphae measure 2 to 4 μ in diameter. The fertile ones are generally multiseptate, each segment giving rise to one or two lateral, bottle-shaped phialids, 3·5 μ in diameter and 6 to 10 μ long; the outer membrane forms a collar round the apex within which the round, oval or elongated, hyaline conidia develop centripetally. The rounded conidia measure 1·7 to 2 μ in diameter, and the others 3·7 by 1·7 to 2 μ. Atypical phialids are also described. On Czapek's agar chains of thick-walled, septate bodies resembling arthrospores have been observed. Contrary to the description given by Medlar (*J. med. Res.*, xxxii, pp. 507–523, 10 figs., 1915) no mucilage was observed

grouping the conidia at the extremity of the phialids, and this also applied to Thaxter's original strain.

Bèregoff-Gillow (Pauline). **The importance of early diagnosis in mycotic diseases, with special reference to blastomycosis: with a brief report of two cases.**—*Canad. med. Ass. J.*, xxxiv, 2, pp. 152–155, 6 figs., 1936.

After commenting on some cases in the relevant literature illustrating the importance of early diagnosis in blastomycotic diseases, the writer gives notes on the organisms isolated from the sputa of two supposedly tubercular patients at the Women's General Hospital, Montreal. One formed on glucose agar, luxuriant, smooth, white colonies, consisting of round and oval cells, 3 to 7 μ in diameter, some of which budded without any mycelium. All sugars were fermented. The intravenous inoculation of guinea-pigs and rats resulted in the development of multiple abscesses in almost every organ, the lungs in particular being studded with white nodules resembling tubercles. This organism is referred to *Blastomyces* [*Blastomycoides*: *R.A.M.*, viii, p. 103].

The fungus from the second case also grew profusely on glucose agar but fermented no sugars and produced only a little acid in glucose. Mycelial growth in liquid media was scanty. The cultural characters of this organism were those of a *Cryptococcus* and resembled the description of *Torulopsis macroglossiae* [ibid., xiii, p. 162].

Maunder (J. C. J.). **Ergotism in dairy cattle.**—*Qd agric. J.*, xlv, 3, pp. 250–251, 1936.

A brief description is given of the symptoms and treatment of a disease of cattle in Queensland, which resembles staggers, and is caused by the presence on paspalum [*Paspalum dilatatum*] of ergot [*Claviceps paspali*: *R.A.M.*, x, p. 463].

Atkins (W. R. G.). **The preservation of fishing-nets by treatment with copper soaps and other substances.**—*J. Mar. biol. Ass. U.K.*, N.S., xx, 3, pp. 627–641, 1936.

Continuing his experiments on the preservation of fishing-nets by chemical treatment at the Laboratory of the Maine Biological Association, Plymouth [*R.A.M.*, x, p. 733], the writer found frequent treatments with cutch (tannin-containing extracts from various tropical trees) to be injurious, but the application every four months of Olie's method (cutch followed by 10 to 15 minutes' immersion in 1 per cent. ammoniacal copper sulphate) kept cotton netting in good condition for six years and eight months in aquarium sea-water [cf. ibid., xv, p. 91]. A single treatment by Olie's method preserved trawl twines of Benares sann hemp (*Crotalaria juncea*), New Zealand *Phormium* fibre, and East African sisal (*Agave sisalana*) for 34, 34, and over 48 months, respectively, under conditions leading to the decay of untreated material in less than five months. Good results were also obtained with a neutral tar oil derived from the 'coalite' low temperature distillation process (Coalite Works, Gawber, Yorks). Effective mixtures consist of 1 lb. oleate, mixed soaps, or resinate, and 1 lb. coal tar per gall. benzene or petrol. Cuprinol [cf. ibid., xv, p. 413] as now

sold for nets has tar incorporated by the manufacturers. Single treatments with such mixtures have preserved cotton netting up to 3½ years. A copper resinate and coal tar mixture maintained the strength of 2-in. sisal rope at 80 to 97 per cent. of its original value for a year compared with 18 per cent. for the untreated control.

ATKINS (W. R. G.) & PURSER (J.). **The preservation of fibre ropes for use in sea-water.**—*J. Mar. biol. Ass. U.K.*, N.S., xx, 3, pp. 643–654, 1936.

The results of tests in sea-water at Plymouth in the preservation of fibre ropes [cf. preceding abstract], showed the efficacy of green cuprinol containing tar, 10 per cent. copper oleate in a light coal tar, 10 per cent. copper resinate in 'coalite' heavy oil or creosote, and 10 per cent. copper oleate with 20 per cent. 'coalite' tar in 'coalite' neutral oil, b.p. 100° to 245° C. (a very cheap solvent). All these maintained thin Manila rope at or above 70 per cent. of its initial strength for 10½ months, whereas that of the untreated control was reduced to 13 per cent. Among other mixtures maintaining the rope at 60 to 69 per cent. of its initial strength were 10 per cent. copper oleate and 20 or 10 per cent. coal tar in benzene, 10 per cent. copper oleate and 20 per cent. 'coalite' tar in benzene, and Shell wood and Shell canvas preservative each with 10 per cent. coal tar.

Copper resinate (10 per cent.) in a light coal or 'coalite' tar maintained the strength of material for two to five months; and a very useful and inexpensive dip may be obtained by using 'coalite' neutral oil, b.p. 170° to 230°, as a solvent for the copper resinate. For hard use hardwood tar ('Shalco' from Messrs. Shirley Aldred, Worksop) or softwood (Stockholm) tar may be employed. 'Corroid' coal tar (Messrs. Hardman, Hull) and coalite tar are also particularly recommended. All these tars are greatly improved by the admixture of a copper soap at the rate of 1 lb. per gall.

Bolting silk plankton nets may be preserved by treatment with copper oleate or copper resinate in benzene with no, or very little, tar; but the best results were given by immersion in a dilute solution of copper naphthenate with tar, obtained by mixing 'green cuprinol for nets' with three volumes of petrol. The durability of cotton and flax fishing lines for use on rods can be lengthened by soap and tar solutions in benzene.

A rough idea of the utility as a preservative of a copper or zinc soap may be obtained by testing the treated material with salt or fresh water with the addition of a trace of sodium diethyldithiocarbamate; by this means it is possible to gauge the rate at which traces of copper (golden-yellow) or zinc (white) are being given off.

KINGHORN (W. O.). **Glomerella phacidiomorpha (Ces.) Pet. on Phormium tenax in Britain.**—*Ann. appl. Biol.*, xxiii, 1, pp. 30–44, 1 pl., 2 figs., 1936.

In the spring of 1934 a portion of a neglected crop of New Zealand flax (*Phormium tenax*) growing in Devonshire showed two types of infection, one characterized by oval patches of dead tissue on otherwise healthy leaves, while in the other entire leaves died and turned greyish-

brown, often rolling up along their entire length. In this second type of infection the cuticle peeled off in large flakes, exposing fungal fructifications which in places made the leaves jet black; infection apparently had spread downwards from the tips.

Conidial acervuli were abundantly present on the dead areas and sometimes several joined into a long streak-like pustule running longitudinally between the veins. The conidiophores were about 20 μ long with a few septa, and the solitary, hyaline (orange-red in the mass), slightly granular, unicellular conidia, 19 to 26 by 5·5 to 7·5 μ, varied from subclavate cylindrical, to ovoid-elliptical, occasionally irregularly curved, and usually flattened at the point of attachment. The conidial stage was identified as *Colletotrichum rhodocyclum* with which *Cryptosporium rhodocyclum*, *Phyllosticta haematocycla*, *Fusarium phormii*, *Gloeosporium phormii*, and *Gloeosporidium rhodocyclum* are regarded as synonymous.

The perithecial stage of the fungus, *Glomerella phacidiomorpha* [as established by cultural experiments], occurred all over the dead leaves, usually crowded together. The perithecia were embedded in the tissues, and measured 200 to 300 μ in diameter. The sessile or shortly stalked, cylindrical or spindle-shaped asci, with a thickened truncate apex, measured 50 to 70 by 10 to 15 μ and the ovoid-elliptical to oblong, seldom irregular, unicellular, hyaline, ascospores 12 to 15 by 5 to 6 μ when ripe and dry (14 to 22 μ long when soaked in water). Paraphyses were present but became mucilaginous as the asci ripened. Revised descriptions of the two stages are given.

Inoculation tests showed the fungus to be only weakly parasitic, but it is thought to be a potential source of danger to crops of lowered vitality. The fungus has been reported from New Zealand under the name *F. phormii* [cf. *R.A.M.*, i, p. 295] as causing large leaf blotches, and has also been recently recorded from Latvia [as *Physalospora phormii*: ibid., viii, p. 87] and Kenya [cf. ibid., x, p. 297].

Flachs (K.). **Krankheiten und Schädlinge unserer Gespinstpflanzen.** [Diseases and pests of our fibre plants.]—*Nachr. SchädlBekämpf., Leverkusen*, xi, 1, pp. 6–28, 13 figs., 1936. [English, French, and Spanish summaries on pp. 53–54, 57–58, 62–63.]

Parallel with the decline of importation of cotton goods into Germany has proceeded an immense extension of the flax-growing area (from 5,000 hect. in 1933 to 30,000 hect. in 1935), and a similar though more restricted expansion of hemp cultivation has likewise taken place during the same period. In this connexion the writer summarizes, with bibliographical references, the available information on the diseases and pests of these two crops, most of the important recent work on which has been noticed from time to time in this *Review*.

Wenzl (H.). **Knospengallen durch Rosenrost. (Bemerkungen zur morphologischen Einteilung der Gallen.)** [Bud galls caused by Rose rust. (Observations on the morphological classification of the galls).]—*Z. PflKrankh.*, xlvi, 3–4, pp. 204–214, 3 figs., 1936.

In October, 1935, the writer investigated an exceptionally heavy outbreak of rose rust (*Phragmidium subcorticium*) [*P. mucronatum*:

R.A.M., xv, p. 22] in the form of galls on the leaf (winter) buds of *Rosa canina* intended for use as stocks in a nursery near Vienna. About every twentieth plant out of several thousand showed at least one infected, hypertrophied bud, while the leaves were also heavily rusted and fell prematurely; on the other hand, there were only a few isolated *Caeoma* pustules on the cortex of the shoots. By reason of the thickening and enlargement of the bud axis and its adherent scales and leaf primordia the affected organs measured up to 20 by 13 mm. The two lateral, normally invisible dormant buds, moreover, were so stimulated as to reach a length of up to 1 cm. *Caeoma* pustules were found on the enlarged bud scales, and even on the minute innermost leaflets and primordia. The hypertrophied buds were found to contain large masses of spores. The bud axis showed an extensive development of the pith and consequent hypertrophy of the vascular bundle ring. Cases were observed in which the diseased buds prematurely produced apparently normal leaflets, the development of which, however, was sooner or later arrested by the injury to the tissues of the axis and the petiole base.

The galls formed by *P. mucronatum* on rose buds conform more nearly to Küster's 'histioid' type than to the 'organoid', though representing a transitional stage in their approximation to the shape of the affected organ. In conclusion, the writer points out some difficulties attending the morphological grouping of certain anomalies of gall formation and briefly discusses the accurate definition of the 'products of the gall-forming agent' in Küster's sense of the phrase.

SLATE (G. L.). **Disease among the Lilies.**—*Horticulture*, xiv, 5, pp. 96–97, 1936.

A popular note is given on mosaic [*R.A.M.*, xiv, p. 634; xv, p. 444] and *Botrytis* blight [*B. elliptica*: ibid., xiv, p. 513] of lilies and their control in New York, the former mainly by the use of healthy stock and the latter by regular treatment with Bordeaux mixture 4–6–50 and appropriate cultural measures. The writer has found the following species susceptible to mosaic: *Lilium auratum*, *L. tigrinum*, *L. speciosum*, *L. batemanniae*, *L. chalcedonicum*, *L. sargentiae*, and the *elegans-umbellatum* group, while *L. henryi*, *L. hansoni*, and the Backhouse hybrids appear to be resistant and *L. regale*, *L. tenuifolium*, *L. amabile*, and others commonly raised from seed commercially are much freer from disease than those propagated vegetatively. *B. elliptica* chiefly attacks *L. candidum*, *L. testaceum*, and *L. chalcedonicum*, while *L. croceum*, *L. willmottiae*, and some of the *elegans-umbellatum* group are less susceptible. A basal rot caused by a soil-inhabiting *Fusarium* has given much trouble, and so far the only remedy known is to dig up affected bulbs, immerse them for 30 minutes in 1 in 40 formaldehyde, and replant on another site.

SCHMIDT (H.). **Die Bandstreifenkrankheit der Nelken.** [The ribbon stripe disease of Carnations.]—*Kranke Pflanze*, xiii, 3, pp. 49–50, 1 fig., 1936.

Both greenhouse and outdoor carnations in Saxony are stated to suffer heavy and increasing damage from the so-called 'ribbon stripe' disease (*Pseudodiscosia dianthi*) [*Heteropatella valtellinensis*: see above,

p. 468]. Whitish-grey, transverse bands, up to 1 cm. in width, encircle the leaf on both sides, or it turns a uniform grey from the tip downwards for about a third of its length. Shoots and pedicels are similarly affected. The infected tissues wilt and shrivel and ultimately the diseased organs collapse; scarcely any marketable flowers are produced. The disease is particularly severe on the Agadir variety, Victory, Aline, and Souvenir of Jesche being much less susceptible. Control should be based on appropriate cultural measures, supplemented by spraying with Bordeaux mixture with the addition of an adhesive paste, tezet 10 S [ibid., xv, p. 380], obtainable from Chem. Fabr. Dr. W. Leonhardt, Hamburg, Gr. Reichenstr. 9.

BEAUMONT (A.), DILLON WESTON (W. A. R.), & WALLACE (E. R.). **Tulip fire.**—*Ann. appl. Biol.*, xxiii, 1, pp. 57–88, 2 pl., 1936.

Tulip fire (*Botrytis tulipae*) [*R.A.M.*, xiv, p. 586], caused serious losses in England in 1924, 1928, and 1930, while in 1927 and 1928 infection was so severe in West Cornwall that some growers were unable to market their flowers. Apart from petal blistering, the premature withering of the foliage reduces the production of large bulbs.

B. tulipae is found only on tulips, the reported occurrence of the fungus on other hosts [ibid., iv, p. 285] being probably due to the fact that various species of *Botrytis* are indistinguishable from *B. tulipae* except in artificial culture. There appears to be no inherent varietal resistance to infection under favourable conditions.

Besides the well-known symptoms of 'fire', the fungus causes a second type of symptom, 'spot', i.e., small, dry, slightly sunken, yellowish- or greyish-white, circular spots with a pale grey centre surrounded by a yellow ring, as well as 'bulb rot', when the whole plant is undersized and sickly pale or yellowish-green. Flower-spotting, which often occurs on an epidemic scale, is of two types. In one, the spots are dry, white, and slightly sunken; in the other, 'blister spot', they are white, puckered, raised, and confluent.

The conidia are formed on the living host less readily in low than high light intensities; a 90 to 100 per cent. humidity is necessary for their formation, for which 24 hours suffices at April temperatures. They are very easily detached and are dispersed by wind and splashed off the leaves by rain. Experiments showed that a drop of water falling 13 ft. on to a diseased leaf scattered spores over an area of at least 3 sq. yds. A field with 1·3 per cent. fire lesions more or less uniformly scattered over it would thus be completely spotted by rain, assuming the number of bulbs per acre to be about 120,000. As many as 156 spores were counted in one small splash covering about 3 sq. mm. Since high humidity is necessary for germination and the spores germinate rapidly, this method of dispersal is particularly favourable to infection. In the forcing house the condensation of water on the glass is a fertile source of infection, which may also be transmitted by aphids. The rapidity with which spots develop in the field shows that the spores must start to germinate almost as soon as they alight on the leaf. Conidia kept dry in the laboratory for 30 days gave 100 per cent. germination, which was still vigorous after 50 days; it then declined considerably, though weak germination of a few conidia was still possible after six months.

From 1924 to 1934 high rainfall in March and April was generally followed by a severe epidemic of fire, but in 1932 and 1933 only slight infection resulted as humidity was low. It is doubtful whether temperature is a limiting factor in England, low humidity, which usually accompanies high temperature, probably being the deciding factor.

Control depends on careful handling, annual lifting, cleaning, planting in fresh soil, roguing out and destroying fresh infections, and avoiding wounding; spraying and dusting are only adjuncts. Tests on chemical control, which did not give promising results, showed that 2 per cent. copper sulphate solution was harmless to the sclerotia, that 2 hours' immersion in 0·05 per cent. mercuric chloride solution prevented germination, that after 15 minutes in undiluted formalin only 2 out of 16 pieces of sclerotia grew, and that 5 minutes' immersion in boiling water killed the sclerotia. In another investigation at Cambridge methyl mercuric chloride 1 in 100,000 killed the sclerotia after 2 hours' immersion, though both the same treatment and one at double the strength were harmless to tulip bulbs.

Takimoto (S.). **Bacterial plant diseases in Japan. V. A bacterial disease of pot Marigold.**—*Ann. phytopath. Soc. Japan*, v. 4, pp. 336–341, 3 figs., 1936.

A destructive disease of marigolds (*Calendula officinalis*) first observed near Hukuoka, Japan, in 1935, was found to be due to *Bacterium calendulae* n.sp., which consists of short rods with rounded ends, occurring singly or in pairs, 1 to 2 by 0·5 μ, motile by means of 1 to 3 polar flagella, Gram-negative, forming circular, smooth, flat, dirty white colonies on agar, not liquefying gelatine or coagulating milk, growing well in Uschinsky's and Cohn's solutions, aerobic, producing a small amount of indol, not reducing nitrates; with minimum, optimum, and maximum temperatures for development of 0° to 4°, 27° to 30°, and 37° C., respectively; thermal death point 50°; and a group number *Bact.* 212.2332032. The heaviest damage is caused during rainy autumn weather among dense stands. The mid-ribs of the leaves turn dark brown or black, with large spots on the blades, causing distortion of the foliage and stems. Positive results were given by inoculations by means of spraying or rubbing.

Gibbs (J. G.). **Pelargonium-rust.**—*N.Z. J. Agric.*, lii, 3, pp. 142–147, 4 figs., 1936.

Pelargonium rust (*Puccinia pelargonii-zonalis*) [*R.A.M.*, vi, p. 257] is stated to be common in New Zealand. After a few notes on the morphology and life-history of the fungus, the author describes control experiments the results of which showed that in glasshouses the disease is effectively combated by weekly sprayings of the plants with lime-sulphur containing 0·083 per cent. polysulphides (those containing 0·1 per cent. caused leaf scorch), and outdoors by sprays with 2 lb. colloidal sulphur in 100 galls. water. A good prophylactic measure is to remove the leaves and bracts of cuttings, and to wash the stems thoroughly in running tap water.

Dodge (B. O.) & Reed (G. M.). **Notes on rust diseases of Sempervivum and other ornamentals in the New York area.**—*J. N.Y. bot. Gdn*, xxxvii, 435, pp. 54–59, 4 figs., 1936.

Among the rusts referred to in the notes are *Pucciniastrum myrtilli* [*R.A.M.*, x, p. 532], which is common on the leaves of rhododendron and azalea in nurseries, sometimes destroying quantities of seedlings, and *Endophyllum sempervivi* [ibid., xiv, p. 464] attacking *Sempervivum tectorum*. The latter has not spread widely since its introduction into the country about twenty years ago. The writers traced the growth of this parasite from the leaves down to the crown, and to the new runner shoots during the summer, the offshoot plants developing pustules the following spring. The fungus also penetrated the root system.

Trapp (G.). **A bacillus isolated from diseased plants of Aucuba japonica (Thunb.).**—*Phytopathology*, xxvi, 3, pp. 257–265, 1 fig., 1936.

From necrotic lesions on the stems, leaves, and roots of Japanese laurels (*Aucuba japonica*) affected by die-back, the writer isolated at Glasgow University a new bacillus which he describes in full and names *Pseudomonas aucubicola* n.sp. Inconclusive results having been given by inoculation experiments and the organism being apparently absent from tissue preparations in a state of active necrosis, the bacillus is provisionally regarded as a saprophyte of special habitat.

Spierenburg (Dina). **Een virusziekte in Lupinen (donkere strepen en vlekken op de stengels; afsterven der toppen; gekroesd of violet-bruin blad).** [A virus disease of Lupins (dark stripes and spots on the stems; dying-off of the tops; crinkled or purplish-brown leaves).]—*Tijdschr. PlZiekt.*, xlii, 3, pp. 71–76, 1936.

Lupins in experimental plots at the Wageningen Agricultural College, Holland, were severely affected in the summer of 1935 by a disease apparently corresponding with that reported from Germany and New Zealand under the names of 'browning' and 'sore shin', respectively [*R.A.M.*, xv, p. 101]. Both bitter and sweet (non-alkaloidal) sorts were attacked, the bitter blue (*Lupinus angustifolius*) suffering the heaviest damage; the bitter white (*L. albus*) also developed infection at an early stage, whereas in bitter and sweet yellow (*L. luteus*) the appearance of the symptoms was delayed until autumn, when they assumed an acute form.

The root-collars of diseased plants show a conspicuous brown discoloration both above and below soil-level, with brownish-black stripes and spots extending up the stem and penetrating inwards to the xylem. The larger lesions are frequently covered with masses of *Fusarium* spores. A somewhat bushy aspect is lent to the plants by the profuse branching of the stems. The roots are brown, dead, and often decayed, while the cortex is largely missing, possibly due to infection by *Rhizoctonia* [*Corticium*] *solani*. In yellow lupins the leaves curl inwards, bending slightly upwards so that they resemble claws, and show a somewhat mosaic-like mottling of alternate pale and dark green areas, and brown stripes and spots. The apical shoots are a little twisted; they bend, droop, and finally are mostly shed, leaving a discoloured patch on the stem. The lower leaves shrivel, turn brown, and droop.

The growing tips of the young shoots of blue lupins wilt, twist to one side, and soon fall, while the lower leaves turn purplish-brown and the whole plant rapidly dies; there are no obvious mosaic symptoms. Diseased white lupins present an altogether crinkled appearance, even the leaflets curling upwards; as in *L. luteus* the leaves are mottled and the lower ones droop. Once a lupin of any sort is attacked, the inflorescences either fail to develop or are distorted. Such pods as ripen show a more or less extensive black discoloration, hang downwards in contrast to the erect position of the healthy ones, and ultimately die. The seed is poorly filled, discoloured, and abnormally spotted.

HIROE (I.). **Brachysporiose of plants. VI. Three new leaf blight diseases of certain plants of the Gramineae and Cyperaceae.**—*Ann. phytopath. Soc. Japan*, v, 4, pp. 318–335, 9 figs., 1936. [Japanese, with English summary.]

Comprehensive morphological, physiological, and pathological studies on five strains of *Brachysporium* [cf. *R.A.M.*, xv, p. 266] found, respectively, on rice, chilli (*Capsicum annuum*), *Cynodon dactylon*, *Eleusine indica*, and *Coix lacryma-jobi* var. *frumentacea* in Japan are stated to have demonstrated their complete agreement, and all are accordingly referred to *B. senegalense* Speg. (group IV of the genus). Vigorous growth was made on various media, the colonies presenting a dark grey, cottony aspect with grey or white centres and producing numerous sclerotia on synthetic substrata with asparagin. Moderate sporulation occurred on Saito's onion-soy, apricot, maize meal, and potato agars, and on synthetic media containing asparagin or peptone. The optimum temperature for mycelial development was found to be about 28° [C.], with a maximum of 40°. Positive results were given by inoculation experiments with the five strains on the above-mentioned Gramineae and wheat. The conidia of this group are short-fusiform, with 3 or 4 septa.

BORNHÖVD (LISELOTTE). **Beiträge zur Biologie von Ustilago hypodites (Schldl.) Fr. auf Elymus arenarius L.** [Contributions to the biology of *Ustilago hypodytes* (Schldl.) Fr. on *Elymus arenarius* L.]—*Phytopath. Z.*, ix, 1, pp. 69–97, 6 figs., 1936.

A comprehensive account is given of the writer's studies at the Hamburg Institute of Applied Botany on the biology of *Ustilago hypodytes* [*R.A.M.*, xiii, p. 435], a parasite of the dune grass, *Elymus arenarius*, affected plants of which are stated to reach a height 10 to 20 cm. in excess of that of healthy ones and to produce an abnormal profusion of internodes and leaves [cf. ibid., xv, p. 360.] A list is given of 67 grass hosts of the fungus (including 26 species of *Bromus*) on which infection experiments are in progress. The fungus is believed to overwinter in the root system and to be conveyed upwards by means of the new leafy shoot. The mycelium grows both inter- and intracellularly and spores (3 to 5·5 μ in length) are formed basipetally on the stem surface. The optimum temperature for the development of the smut in culture is between 26° and 29° C. and a H-ion concentration of P_H 6·5 to 7·5 is requisite. The germination processes of *U. hypodytes* were

found to resemble those of *U. nuda*. The cytology of the fungus is described in detail.

MacLachlan (J. D.). **Studies on the biology of Gymnosporangium globosum Farl.**—*J. Arnold Arbor.*, xvii, 1, pp. 1–24, 10 pl., 1 map, 1 graph, 1936.

In this account of the diseases caused by *Gymnosporangium globosum* [*R.A.M.*, xiv, p. 368] the author, after giving a list of 12 synonyms, describes the distribution of the fungus, which is confined to the eastern and central parts of the United States and southern Ontario and Quebec. The rust is increasing in prevalence, and is causing great damage in local areas, especially in New York State. On *Crataegus* foliage the first symptoms of infection are visible ten to twelve days after inoculation, and develop three days later into bright yellow spots, 1 to 10 mm. in diameter, on which the spermogonia are formed. If over 50 per cent. of the leaf area is diseased leaf yellowing and defoliation may set in at this stage. Opposite the spermogonia the lower surface of the leaf swells and may be more than five times its normal thickness. The peridia of the developing aecidia become evident about 96 days after inoculation; they may exceed 6 mm. in length, and each lesion may bear from 1 to over 50. High winds and leaf-rubbing cause the peridia to break up and the aecidiospores (most of which are distributed by mid-September) to be released. On *Pyrus* foliage the lesions are smaller and on *Sorbus* and *Malus* they seldom exceed 2 mm. in diameter; certain species of the latter show spermogonia only. Infection of *Crataegus* flowers and fruit is rare and fruit infection of *Pyrus* and *Malus* was not observed. *Crataegus* twigs are relatively rarely attacked, and on the current year's growth only.

On red cedar (*Juniperus*) [*virginiana*] the first symptoms are seen on one-year-old leaves about 1st August. A yellow chlorotic zone or band appears, and is closely followed by the development of a slightly raised area on the upper surface, which splits, allowing the young gall to emerge. In late autumn and winter the galls are smooth, shiny, mahogany-red, and seldom over ½ cm. in diameter. The tongue-like teleutosori, 6 to 12 mm. high, develop the following spring and the teleutospores appear as a cinnamon-brown pulvinate mass. The teleutospores are typically bi- (occasionally tri- or quadri-) cellular, no unicellular ones having been observed by the author. Wetting of the teleutosori by rains in May causes them to expand to many times their original size, owing to the hygroscopic nature of the pedicels. Most of the teleutospores germinate by 25th May, and the dried-up remnants are blown away, leaving a smooth, orange scar bordered by the torn edges of the broken corky epidermis. The galls continue growth during summer, causing distortion and occasionally killing the twig beyond the gall.

Normally the teleutospores germinate within six to eight weeks of their formation, but under low temperature conditions they may remain viable much longer. The aecidiospores show no more than 2 or 3 per cent. germination at the time of formation, but if kept at 0° C. abundant germination can be obtained within a month and more than 80 per cent. by October; from the beginning of March, however, the percentage germination falls off rapidly.

Laboratory tests showed that none of the spore forms germinated unless in direct contact with water, excess of which caused irregularity in the germination percentage, the teleutospores germinated in excess water, but instead of producing basidiospores the promycelia grew to great lengths and sometimes exhibited long side tubes or broke up into elongated, spore-like bodies. The optimum temperatures for the germination of the teleutospores, basidiospores, and aecidiospores were 25° (98·6 per cent.), 20° (83·9 per cent.), and 20° (88·7 per cent.), respectively; at temperatures under 10° and over 30° the germination percentage of all three forms fell to nearly zero.

When aecidiospore infection of red cedars takes place precisely is unknown, but it is thought to occur in late autumn after frosts.

ROTHE (G.). **Eine neue Methode zur Berechnung der Spritzbrühenmenge bei der Obstbaumspritzung.** [A new method of calculating the spray volume in fruit tree spraying.]—*NachrBl. dtsch. PflSch-Dienst*, xvi, 2, pp. 13–15, 1 graph, 1936.

By plotting the amount of spray required for the winter treatment of apple trees against the stem circumference an asymptotic curve was obtained with its axis corresponding to the equation $x/45—y/27=1$ where x = stem circumference in cm. and y = litres of spray used. On the basis of this curve the volume of spray liquid required for the treatment of a given tree is calculated, not as heretofore on the basis of its age, but on that of the circumference of its trunk [cf. *R.A.M.*, xi, p. 522]. For winter treatments the spray volume required for a tree with a trunk girth of 20 cm. is 3 l., rising steadily to 65 l. for one measuring 150 cm. For summer applications, which are made with nozzles of smaller diameter, less liquid will be necessary. The annual increase in girth of the trunk of plum, pear, and cherry trees has been estimated by Steglich to average 2·4, 3·1, and 3·7 cm. respectively, compared with 1·5 cm. for apple, and under Loewel's system proportionately greater amounts must be allowed for spraying the former trees (up to 50 per cent. more for cherries than for apples).

KEITT (G. W.) & NUSBAUM (C. J.). **Cytological studies of the parasitism of two monoconidial isolates of Venturia inaequalis on the leaves of susceptible and resistant Apple varieties.**—Abs. in *Phytopathology*, xxvi, 2, pp. 97–98, 1936.

A cytological study of apple leaves inoculated in the greenhouse with two strains of *Venturia inaequalis* [*R.A.M.*, xi, p. 461 and above p. 480] showed that in all cases a minute infection hypha penetrated the cuticle directly and gave rise to a dendritic subcuticular mycelium. One strain (22a) was virulently pathogenic to the Yellow Transparent variety but only moderately so to Fameuse, while in 17a the relations were reversed. Missouri Pippin was resistant to both strains. In very susceptible leaves progressive depletion of plastids and cytoplasm, accompanied by increased vacuolation, began to appear about ten days after inoculation in the upper palisade layer in the middle of the lesion, gradually spread throughout the area underlying the fungus, and was succeeded by necrosis. The fungus showed no apparent injury until after the death of the host cells. In moderately susceptible leaves

fungal growth was not so active and the depletion of the host cells correspondingly less extensive, while in the resistant foliage of Missouri Pippin the development of the organism was greatly restricted, only localized epidermal necrosis occurring with 22a and none with 17a.

FARISH (L. R.) & DUTTON (W. C.). **Comparison of several materials for Apple scab control in 1935.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xviii, 3, pp. 155–159, 1936.

Details are given of comparative spraying tests in a Grand Rapids (Michigan) orchard in 1935 against apple scab [*Venturia inaequalis*] with 'electric sulphur', lime-sulphur, and Koppers dry wettable flotation sulphur [*R.A.M.*, xiv, p. 591] at various concentrations. It was found that both the 'electric' and dry wettable sulphurs gave satisfactory control at the rate of 6 lb. per 100 galls. spray, provided the operations were started early and repeated with sufficient frequency. In practice, however, a higher concentration would probably be advisable for pre-blossom applications since many growers do not spray very thoroughly.

ZELLER (S. M.) & WILCOX (L. P.). **Nectria canker of Pear.**—*Plant Dis. Reptr*, xx, 5, pp. 83–84, 1936. [Mimeographed.]

Attention is drawn to an unusual case of pear canker (*Nectria galligena*) in an Oregon orchard on heavy clay adobe soil, in which the fungus attacked some newly planted Bartlett and Anjou trees below soil-level. The first sign of infection was observed about 1½ years after planting, the cankers starting near the base and running for several inches in both directions, in many cases more or less girdling the trees. *N. galligena* was isolated from 42 per cent. of the diseased tissues examined, and the imperfect stage *Cylindrocarpon mali* was commonly present in crevices in the bark. Satisfactory control was effected by the excision of the infected areas (or superficial scarification of the bark in milder cases), followed by the application to the wounds of Bordeaux paint, the number of trees lost through the disease being gradually reduced from 400 in 1931 to none in 1935.

PLAKIDAS (A. G.). **Crown girdle of Pear trees.**—Abs. in *Phytopathology*, xxvi, 2, p. 105, 1936.

For some years Chinese sand pears [*Pyrus serotina*] in Louisiana have been affected by an extensive bark canker, starting near soil-level and involving the trunk sometimes as far upwards as the crotch and downwards to the main roots, and finally girdling and killing the tree. A white Basidiomycete associated with the later stages of the disease is believed to be a secondary invader of the tissues between the bark and wood of the trunk, since it failed to produce infection of the living cortex. However, another fungus, probably *Dothiorella* [*Botryosphaeria*] *ribis* [cf. *R.A.M.*, xv, p. 238], constantly found on infected material, produced typical large cankers in inoculation experiments and is thought to be responsible for the initiation of the trouble, which appears to be promoted by freezing injury. The disease also affects apple and tung-oil [*Aleurites fordii* or *A. montana*] trees. Scraping the affected bark and painting the wood with Bordeaux paste has given good control.

Rosen (H. R.). **The abscission of Pear and Apple blossoms in relation to infection by Erwinia amylovora and Phytomonas syringae.**—Abs. in *Phytopathology*, xxvi, 2, pp. 106–107, 1936.

The examination in the spring of 1935 of abscissed Kieffer and Garber pear blossoms revealed the extensive occurrence of blackish spots on various parts of the receptacles, 64 isolations from which yielded 46 bacteria demonstrated to be pathogenic by inoculation experiments with pure cultures. Of these organisms, 29 were identified as *Erwinia amylovora* [*Bacillus amylovorus*: *R.A.M.*, xv, p. 374] and 17 as *Phytomonas* [*Pseudomonas*] *syringae* [ibid., xv, p. 139], while both were obtained from five of the isolations. Counts of several hundred Kieffer blossoms showed that some 85 per cent. were infected. The poor setting of fruit [in Arkansas] at the time of the investigations was attributed to the extremely heavy rainfall and cloudy days of April and May, but it is evident that this was not the only factor concerned.

Arnaud (G.) & Arnaud (M.). **Les maladies à virus des Rosacées amygdalées.** [The virus diseases of Amygdalaceous Rosaceae.]—*C.R. Acad. Sci.*, *Paris*, ccii, 10, pp. 869–871, 1936.

Since 1933 the writers have made a study of some virus disturbances of *Prunus* (sensu lato) [*R.A.M.*, xiv, p. 642] in France. The symptoms, which consist typically in the development of sharply defined yellowish-green, mottled zones in the shape of chevrons, or acute angles on either side of the veins, appear very early in the spring. When the narrow strip of mottled tissue is situated near the edge of the leaf it is apt to break up into discontinuous lines or round, isolated, scattered lesions (a common type of the trouble in peach). The mosaic strips recall the sinuous lines dividing the living from the dead tissue in a leaf undergoing gradual desiccation; they appear to represent zones of equal vitality which may be termed isobiotic foliar lines. In some cases the confluence of two such lines results in the formation of ring spots, ovals, or lozenges. Spontaneous infection of this nature has been observed on apricot, plum, myrobolan, cherry, and peach, while positive results were given by inoculation experiments in the case of apricot (scions from diseased myrobolan and peach), plum (myrobolan), *P. spinosa* (myrobolan), almond (myrobolan), peach (myrobolan, peach), and bird cherry (*P. avium*) with myrobolan and peach scions.

Joëssel (P. H.) & Lidoyne (A.). **Essais de traitements contre la chlorose du Pêcher.** [Experiments with treatments against Peach chlorosis.]—*C. R. Acad. Agric. Fr.*, xxii, 7, pp. 306–311; 8, pp. 315–320, 1936.

In the first part of this paper the writers summarize the results of their experiments in 1933–4 and 1934–5 with Mokrzecki's method (with modifications) of treating peach chlorosis [*R.A.M.*, xiii, p. 384; xiv, p. 319] by means of introducing ferrous salts at the rate of 1 gm. per tree, through two holes, one on each side of the trunk. The 73 trees used in the tests were situated in one locality of Gard and two of Vaucluse. The most satisfactory of the salts used were double tartrate

of iron and potassium and double sulphate of iron and ammonium, the former having completely restored to health a twelve-year-old Amsden peach that had suffered from chlorosis for several years and in 1933 bore nothing but small, unmarketable fruit. As a sequel to treatment on 27th April, 1934, it resumed a normal green coloration, put out shoots $1\frac{1}{2}$ m. or more in length, and produced during the favourable season of 1935 52 kg. of first- and second-grade fruit. Ferrous nitrate and double tartrate of iron and ammonium caused severe injury, while less grave effects followed injection with ammoniacal ferrous citrate. The time of treatment was found to be of great importance, the maximum benefit being derived from applications coinciding with activity in the ascent of the sap. Thus, in a test in 1935 the remedial effects of treatments applied on 12th April were distinctly superior to those given by the same methods on 7th May.

The second part of the paper deals with tests in 1934–5 on the efficacy of the methods of Gris (spraying during the vegetative period with a dilute solution of iron sulphate) and Rassiguier (painting pruning wounds with a very concentrated solution of iron sulphate). The latter procedure was modified by the substitution for pruning wounds of two cuts, 10 cm. in length, on two branches of each tree. Of the salts used, in addition to iron sulphate, at a strength of 30 per cent., double tartrate of iron and potassium was undoubtedly the most effective, followed by citro-ammoniacal pyrophosphate of iron and ammoniacal citrate of iron. The first-named caused practically no scorching and the cuts healed rapidly and perfectly, but there was some desiccation of the branches. Iron sulphate and double sulphate of iron and ammonium also gave good control of chlorosis but caused severe burning of the tissues near the cuts.

In the case of Gris's method, very good results were obtained by the application of double sulphate of iron and ammonium at the rate of some $2\frac{1}{2}$ l. per tree on 24th May, 1935, the other salts used being less effective, though some improvement was effected by pyrophosphate and ammoniacal citrate of iron.

KUNKEL (L. O.). **Immunological studies on the three Peach diseases, yellows, rosette, and little Peach.**—*Phytopathology*, xxvi, 3, pp. 201–219, 6 figs., 1936.

Descriptions are given of the symptoms induced in peach seedlings by the rosette [*R.A.M.*, xiv, p. 374], yellows, and little peach viruses [ibid., xiv, p. 705]. The first-named readily invades trees suffering from either of the other diseases, so that there is presumably no close relationship between rosette and yellows or little peach. On the other hand, trees affected by little peach are immune from yellows and vice versa, indicating that these two disturbances should be classified as strains of the same disease, the presence of one of which within a tree automatically protects it against infection by the other.

Buds with yellows transplanted to little-peach trees produce shoots showing typical symptoms of the latter disease and vice versa. Subinoculations from these shoots transmit the virus carried by the tree into which the bud was transplanted and not that harboured by the bud at the time of the operation. Hence it is concluded that either

virus may displace the other in the diseased tissues. Trees inoculated simultaneously with both the little-peach and the yellows virus by means of buds inserted at different levels in their stems contract the disease carried by the bud in the upper position, which further attacks any shoot produced by the lower bud. Subinoculations from such a shoot also transmit the disease of the upper bud, whence it may be inferred that the site of inoculation determines the identity of the virus prevailing in a given tree.

HENRICK (J. O.). **Diseases of the Raspberry.**—*Tasm. J. Agric.*, N.S., vii, 1, pp. 36–38, 2 figs., 1936.

Notes are given on the symptoms and control of the following raspberry diseases found in Tasmania: mosaic [*R.A.M.*, xv, p. 377], anthracnose (*Plectodiscella* [*Elsinoe*] *veneta*) [ibid., xiv, p. 219], a leaf spot due to a species of *Phyllosticta*, and orange rust (*Gymnoconia interstitialis*) [ibid., xv, p. 237].

TAYLOR (G. G.). **Application of orchard-sprays. II. The portable spraying-system.**—*N.Z.J. Agric.*, lii, 3, pp. 172–174, 1936.

In this, the second paper of this series [*R.A.M.*, xv, p. 379], the author briefly discusses the advantages and disadvantages of the portable spraying apparatus in use in New Zealand, as compared with the stationary system. Under the local conditions, spraying units consisting of more than two men to each apparatus are not recommended. With a delivery of 3 galls. per minute at each nozzle (or combination of nozzles), the pump capacity required for a one-man outfit is approximately 5 galls. per minute, and for a two-man outfit 8 galls. The maximum mixing-tank capacity practicable is approximately 150 galls. for the horse-driven and 250 galls. for the tractor apparatus. The usual practice with horse-driven apparatus is to have hoses about 60 ft. long, the outfit being moved each time eight trees have been sprayed, while with tractor outfits the hoses are 120 ft. long, allowing large blocks of trees being treated without moving the apparatus. The American method of spraying from platforms on the apparatus while moving has been recently introduced into New Zealand; the principal objection to it is that where trees are dense or overhanging, efficient coverage of the foliage with the spray is difficult to obtain, owing to the limited angle from which the spray can be applied. Generally speaking, the use of portable equipment is advantageous in smaller orchards, up to 5 acres, or where various spray treatments are required for a number of different fruit tree varieties.

TAYLOR (G. G.). **Removal of spray material accumulated in the pipes of stationary spraying systems.**—*Orchard. N.Z.*, viii, 11, pp. 11–12, 1935. [Abs. in *Hort. Abstr.*, vi, 1, p. 35, 1936.]

Accumulation of spray materials, mostly consisting of large particles of sulphur, lead sulphides, calcium carbonate, and calcium arsenate may so increase frictional resistance in the pipes of some stationary spraying systems [see preceding abstract] as to cause excessive pressure loss. The best of the cleaning agents tested was commercial hydrochloric acid (1 part to 19 of water). The pipes are filled with the acid

solution, the pump being washed out with water as soon as filling is completed. After about half-an-hour the pipes should be emptied and also washed out with water. A second treatment may be required in cases of extensive deposition.

DUBRISAY (R.). **Quelques applications nouvelles de la chimie colloïdale. Produits émulsifs et produits mouillants.** [Some new applications of colloidal chemistry. Emulsive and wetting products.]—*Chim. et Industr.*, xxxv, 2, pp. 267–273, 4 diags., 1936.

The mathematical principles underlying various modern applications of colloidal chemistry are explained and discussed. A formula is given on the basis of which it is deduced that emulsive agents are also wetters by reason of their capillary activity and their addition to fungicides is of great utility in effecting a distribution over leaves and other plant organs [*R.A.M.*, xv, pp. 105, 382]. This theory presupposes the existence of a capillary tension at the level of separation liquid-solid or solid-gas. It has not been possible to demonstrate experimentally the existence of such a tension, but Freundlich has shown (Kapillarchemie. Akad. Verlagsgesellsch., Leipzig) that it may be logically inferred from a number of established facts.

PETERSON (P. D.). **Safe use of sulphur as a fungicide.**—*Proc. Md hort. Soc.*, xxxvii, pp. 60–67, 1935. [Abs. in *J. Soc. chem. Ind., Lond.*, lv, 24, p. 516, 1936.]

A processed form of sulphur, known as catalytic sulphur, added to ordinary lime-sulphur, was found to accelerate the breakdown of the polysulphides and reduce the risk of injury to sprayed foliage. The addition of the same preparation to lime-sulphur-lead arsenate prevented blackening of the mixture.

GODFREY (G. H.). **Control of soil fungi by soil fumigation with chloropicrin.**—*Phytopathology*, xxvi, 3, pp. 246–256, 1 fig., 1936.

Particulars are given of the writer's laboratory experiments at the University of California to determine the practical fungicidal value of chloropicrin as a soil fumigant [*R.A.M.*, xiii, p. 98]. Cultures of *Fusarium* sp. from gladiolus, *Phytophthora cactorum* from snapdragons [*Antirrhinum majus*: ibid., xiv, p. 195], *Rhizoctonia* (*Corticium*) *solani* and *Sclerotium rolfsii* from sugar beet [ibid., xv, p. 194], *Verticillium albo-atrum* from strawberry [ibid., xi, p. 727], *Dematophora* sp. [*Rosellinia necatrix*] from apple roots [ibid., xiv, p. 176], and *Armillaria mellea* from prune roots [ibid., v, p. 746] were inserted to a depth of 6 in. next to the wall of 4-gall. glazed stone jars of soil to the centre of which chloropicrin was applied at the rate of 1¼ c.c. per jar (equivalent to 400 lb. per acre ft.). The jars were sealed with gas-impervious, glue-coated paper. The duration of exposure was 48 hours.

None of the fumigated cultures made any growth on nutrient agar plates, whereas all the untreated controls gave positive results. Subsequent small-scale tests on the application of chloropicrin to greenhouse soils naturally infested by pathogenic fungi at the standard rate of 2½ c.c. per cu. ft. gave promising indications, as did also a greenhouse trial of the substance at the rate of 400 lb. per acre for the control of

V. [*albo-atrum* or *V. dahliae*: ibid., xiv, p. 283] on tomatoes. The practicability of disinfecting greenhouse potting soils in special air-tight boxes and of sterilizing laboratory glassware by chloropicrin fumigation was also demonstrated.

TOROPOVA (Mme E. M.). **Manufacture of germisan.**—*Trans. sci. Inst. Fertil. Insectofungicides U.S.S.R.*, 123, pp. 208–210, 1935. [Abs. in *Chem. Abstr.*, xxx, 10, pp. 3576–3577, 1936.]

One kg. of germisan was prepared from 92 gm. tricresol dissolved in 430 c.c. 10 per cent. sodium hydroxide, the solution being cooled to room temperature and 198 gm. mercury oxycyanide gradually introduced to the accompaniment of vigorous agitation. The suspension forming towards the end of the reaction was filtered off and the resultant product left for two to three days, at the end of which a gelatinous product was obtained, undergoing complete liquefaction on heating. Water was removed by careful heating and the hot, semi-solid mass dried in an oven at 40° to 50° C. The dry germisan was ground and mixed with sodium chloride to a mercury content of 16 per cent. The final product (identical with that manufactured abroad) contained: water 10, mercury 54·23, and the yield was 86·3 per cent.

DUFRÉNOY (J.). **Méthodes statistiques appliquées à la pathologie végétale.** [Statistical methods applied to plant pathology.]—*Ann. Epiphyt.*, N.S., i, pp. 147–256, 8 graphs, 1936.

In this comprehensive and detailed study the author attempts to show, by means of numerous examples taken from phytopathology, how statistical methods can be of service in elucidating the causes of pathological phenomena and the etiology of disease. The subjects dealt with include the problems of distribution, the criterion of X^2, Student's method for interpreting paired experiments, and the analysis of variation.

BÖNING (K.). **Der pflanzenschutzliche Beobachtungs- und Meldedienst und seine Aufgaben in der Erzeugungsschlacht.** [The plant-protective observation and notification service and its functions in the production campaign.]—*Prakt. Bl. Pflanzenb.*, xiii, 12, pp. 330–338, 1936.

The writer defines the scope and functions of the branches of the Bavarian Plant Protection Service dealing with the observation of diseases and pests and with the transmission to agricultural and horticultural circles of the information necessary to ensure effective control. A distinction must be drawn between the advisory work (including also the recording of data for statistical purposes) and the purely scientific investigation of disease problems. An improved mode of estimating the extent of injury and corresponding losses from disease is proposed, the degree of damage being classified in categories 1 to 5, indicating 0, 1 to 10, 11 to 20, 21 to 30, and over 30 per cent. reduction of yield, respectively, and studies on the correlation between environmental factors and pathological conditions are advocated [cf. *R.A.M.*, v, p. 370]. In conclusion the need for special instruction in plant protection is emphasized.

Jahn (E.). **Die peritrophe Mykorrhiza. 2. Zur Physiologie und Biologie der Begleitpilze.** [Peritrophic mycorrhiza. 2. Contribution to the physiology and biology of the companion fungi.]—*Ber. dtsch. bot. Ges.*, liii, 10, pp. 847–856, 3 graphs, 1936.

In continuation of his work on the endo-, ecto-, and peritrophic types of mycorrhiza [*R.A.M.*, xiv, p. 247; cf. ibid., xv, p. 308], all three of which very frequently occur in combination, especially in humus soils, where they have been most intensively studied, the author seeks to show that the real function of the mycorrhiza is to render available to the higher plant the mineral salts bound up in the soil, rather than that of exploiting for its benefit the organic nutrients of the humus. In favour of this hypothesis, he adduces the high acidifying properties of some of the fungi (especially the calcicolous species) composing the ecto- and peritrophic flora and cites Lohmann's experiments (*Bot. Arch.*, xxxi, 1931), in which it was shown that *Aspergillus niger* is capable of assimilating considerably more phosphoric acid from the soil than phanerogamic crops, and that its ability to dissolve mineral salts was much higher than that of citric acid of the same P_H value and comparable to that of a fairly strong, hot nitric acid solution. He points out further that mycorrhiza are very much more frequent in long-lived forest trees, which grow for several hundred years in the same place, than in annual or biennial crops which cannot long be cultivated successfully in the same soil without the use of fertilizers. It is also suggested that endotrophic mycorrhiza may sometimes result from the entrance of a peritrophic fungus into the root tissues, the vitality of which is never considerable above the rhizoid zone.

In cultural experiments with silicicolous and calcicolous peritrophic fungi (*Penicillium* sp., an undetermined imperfect fungus, and *Mucor ramannianus*, and another species of *Penicillium*, *Fusarium* sp., and *M. strictus*, respectively) in a malt extract medium with or without the addition of 0·5 or 1 per cent. calcium carbonate, it was shown that in every case a sharp retardation of growth occurred on the malt extract medium after 20 days or somewhat later corresponding to a rise in the P_H value of the substratum, which in most cases was first lowered before the rise took place. All the silicicolous fungi developed more vigorously in the medium without calcium carbonate, while the calcicolous fungi were all stimulated by the addition of this substance. The author concludes from the results of his experiments that the vigour of growth of these fungi is closely related to their capacity of acidifying their substratum.

Krassilnikov (N. A.), Kriss (A. E.), & Litvinov (M. A.). Влияние корневой системы на микроорганизмы почвы. [The effect of the root system on the soil microflora.]—*Микробиол.* [*Microbiol.*], v, 2, pp. 270–286, 2 graphs, 1936. [English summary.]

Investigations in the Transvolga are stated to have shown that the zone surrounding the roots (rhizosphere) [see preceding abstract] of wheat, maize, sunflower, and soy-beans is densely populated by micro-organisms, the numbers of which exceed by many millions per gm. of soil those found in the control samples. Particularly dense is the

population of the soy-bean rhizosphere, that of the wheat root zone being relatively sparse and of the other two crops intermediate.

A close correlation was observed between the vital activities of the higher plant and the quantitative composition of the soil flora, the first sharp rise in which coincides with the early stages of vegetation and the second with the fruiting period. Microbiological activity increases at the optimum soil moisture content, declining noticeably immediately after the watering of the plots and then rising to a maximum.

SETO (F.). **Comparison of the cellulose decomposition by plant-pathogenic fungi.**—*Ann. phytopath. Soc. Japan*, v, 4, pp. 308–317, 4 figs., 1936. [Japanese, with English summary.]

Most of the 23 fungal pathogens of plants grown on a synthetic mineral salt solution with filter-paper as the source of carbon were found to be capable of utilizing cellulose to some extent, but in most cases the amounts assimilated were not large. Decomposition of cellulose was effected by *Corticium centrifugum* [*R.A.M.*, xv, p. 389], *Fomes applanatus* [*Ganoderma applanatum*: ibid., xv, p. 147], *Gibberella fujikuroi* [ibid., xv, p. 173], *Pestalozzia diospyri* [ibid., ix, p. 536], *Polystictus pergamenus* [ibid., xv, p. 410], and *P. sanguineus* [ibid., xi, pp. 15, 218], but the most active of the organisms tested in this respect were *Gloeosporium olivarum* [ibid., xiii, p. 789], *Pestalozzia theae* [ibid., x, p. 345] and *Sclerotium oryzae sativae* Saw. [ibid., xv, p. 313].

KOBS (EDNA) & ROBBINS (W. J.). **Hydrogen-ion concentration and the toxicity of basic and acid dyes to fungi.**—*Amer. J. Bot.*, xxiii, 2, pp. 133–139, 1 fig., 5 graphs, 1936.

The results of further experiments on the effect of the hydrogen-ion concentration on the toxicity of acid (eosin and rose bengal) and basic (dahlia) dyes to *Gibberella saubinetii*, *Fusarium oxysporum*, and *Rhizopus nigricans* [*R.A.M.*, vi, p. 468] showed that the acid dyes were, in general, more toxic as the acidity of the culture medium increased, and the basic dye was most toxic in the more alkaline solutions; in some cases, however, the toxicity of the rose bengal was reduced by precipitation of the dye in the most acid solutions. It was found that even a fractional change in P_H sometimes had a marked effect on toxicity; so, for instance, whereas at P_H 4 eosin 1 in 1,000 completely inhibited the growth of *G. saubinetii*, at P_H 4·3 it only reduced the growth to 30 per cent. of the normal. It is believed that the effect of hydrogen-ion concentration on the toxicity of dyes is the result of its influence on the formation by the dye of free base or free acid. Correlations between the isoelectric points previously reported [loc. cit.] for the organisms used and the effect of hydrogen-ion concentration on the toxicity of the dyes were not evident in these experiments.

BOND (T. E. T.). **Phytophthora infestans (Mont.) De Bary and Cladosporium fulvum Cooke on varieties of Tomato and Potato and on grafted Solanaceous plants.**—*Ann. appl. Biol.*, xxiii, 1, pp. 11–29, 1936.

The writer describes in detail an investigation made to ascertain whether increase or decrease in susceptibility to pathogenic fungi could

be induced or transmitted by grafting. The material used comprised eight potato varieties all of which were found in inoculation tests to be equally susceptible to *Phytophthora infestans*, six tomato varieties, of which Giant Red, Golden Queen, and S.F. 2 were found to be susceptible to *Cladosporium fulvum* [see above, p. 481] while Stirling Castle and Manicrop and S.F. 3 were resistant, and other Solanaceous plants, including the currant tomato (*Lycopersicum pimpinellifolium*) which was immune from *C. fulvum* but susceptible, as detached leaves only, to *P. infestans*.

About 50 grafts were made and inoculated with one of the two fungi, in most cases after new growth had developed from stock and scion, controls being provided throughout, and in every instance both stock and scion retained their characteristic reaction to infection unaltered. This result indicates that resistance and susceptibility are either genotypic properties of the protoplasm or are due to some factor not transmissible as such from stock to scion or vice versa. There was no evidence to support Schmidt's view that immunity depends on an anti-germination principle—'prohibitin' [*R.A.M.*, xiii, p. 134; xiv, p. 475].

MORWOOD (R. B.). **Irish blight of Potatoes. Spraying experiments at Beenleigh.**—*Qd agric. J.*, xlv, 3, pp. 232–236, 1936.

A brief account is given of spraying and dusting experiments carried out in 1935 at Beenleigh, Queensland, for the control of late potato blight [*Phytophthora infestans*], the results of which showed that three applications of all the copper-containing sprays and dusts used (except ammoniacal copper carbonate, which caused severe leaf injury) noticeably increased the yield in marketable potato tubers, the increase being of over one ton per acre with 4–4–40 home-made Bordeaux mixture, at a total expense of 18*s*. for the spray materials. Ready-mixed Bordeaux mixtures and copper-containing dusts were also effective, but their higher cost does not warrant their recommendation for general use. In a collateral test, 2–2–40 Bordeaux mixture appeared to be practically as good as the 6–4–40 spray, indicating that thoroughness of application is more important than the actual strength of the mixture, but this result needs confirmation before the 2–2–40 mixture can be adopted in practice.

NAOUMOVA (Mme N. A.). О прогнозе появления **Phytophthora infestans** на Картофеле. [On forecasting the appearance of *Phytophthora infestans* on the Potato].—*Pl. Prot. Leningrad, 1935*, 3, pp. 51–54, 1 fig., 1935. [English summary. Received May, 1936.]

The author states that field observations in 1933 and 1934, supported by controlled experiments, in the neighbourhood of Leningrad showed that Van Everdingen's four weather conditions requisite for the successful establishment of late blight (*Phytophthora infestans*) on the potato [*R.A.M.*, xiv, p. 715] also hold good in that region, but that the length of the incubation period of the disease is mainly dependent on the minimum, mean, and maximum temperatures prevailing on the three days (of 24 hours each) following the 'critical' day; relative atmospheric humidity, on the other hand, did not affect appreciably the length of this period. A statistical elaboration of the field and

experimental data obtained allowed Professor J. L. Pomorski to construct a 'nomogram', from which the incubation period may be ascertained corresponding to the average minimum, mean, and maximum temperatures established for the three days following infection. The accuracy of this method, the significance of which is evident, has been experimentally demonstrated for the Leningrad region, but it is subject to modification for other geographical regions, in dependence on the local meteorological and ecological factors.

STONE (WINONA E.). **Growth, chemical composition, and efficiency of normal and mosaic Potato plants in the field.**—*J. agric. Res.*, lii, 4, pp. 295–309, 1936.

The results [which are tabulated] of studies at Vermont Agricultural Experiment Station during the summer showed that mosaic potato plants (Green Mountain) tended to produce more leaves than the normal, but that the total leaf surface was less, owing to the smaller size of their leaves. The disease slowed down the growth of the plants in height, and of the leaflets, which soon reached the limit of increase in area, so that eventually all the leaves on the diseased plants were fairly uniform in size. Green weight per unit area of the leaves was inversely proportional to the degree of severity of the disease, but dry weight in mosaic plants per unit area was greater than in the normal plant. Ash content was lower in normal than in mosaic plants, but taken in proportion to the dry weight of the roots of normal and diseased plants, it only indicated a slight reduction of the absorbing capacity of the roots by mosaic. The carbon percentage of the dry weight varied little in the normal and diseased plants. The whole work is interpreted to demonstrate that the carbon-fixing apparatus does not function so efficiently in the mosaic as in the normal plants.

MIÈGE (E.). **Influence néfaste de la culture ininterrompue de la Pomme de terre en plaine au Maroc (1934–1935).** [The disastrous influence of the uninterrupted cultivation of the Potato in the plains of Morocco (1934–1935).]—*C.R. Acad. Sci., Paris*, ccii, 8, pp. 681–683, 1936.

Details are given of experiments in the cultivation of Fluke and Industrie potatoes in the plains of Morocco in 1934–5, which confirmed previous observations as to the impracticability of procuring adequate yields of healthy material without constant replenishment of the stock from high altitudes [*R.A.M.*, xv, pp. 171, 255, 310]. By the fourth generation in the plains the length of the growing period is extended, anomalous or pathological conditions develop in the aerial and root systems, and the yield is progressively and significantly diminished.

BOUGET (J.). **Distribution des pucerons sur les hauts reliefs et les fonds des vallées pyrénéennes (région de l'Adour).** [The distribution of aphids on the heights and in the low-lying regions of Pyrenean valleys (Adour district).]—*C.R. Acad. Sci., Paris*, ccii, 4, pp. 341–343, 1936.

In a very sheltered field at an altitude of 1,400 m. in the Pyrenees, six Triumph potato plants yielded 72 tubers with a total weight of 6 kg.

300 gm., the corresponding figures for a plot at the same elevation but exposed to the prevailing north-easterly winds being 162 (17 kg. 250 gm.). Institut de Beauvais seed from Brittany gives satisfactory yields for two to three years on the heights, whereas in the valleys production is reduced by half in the second year. The old Chardonne variety, native to the district, has been abandoned in the plains and low-lying parts of the valleys on account of its poor yields, but on the high mountain ridges it continues to produce abundant crops. These facts are attributed to the presence of aphids (stated in a supplementary note by J. Costantin to be *Typhlocyba* sp. [*R.A.M.*, viii, p. 329]) conveying degeneration viruses in sheltered sites and their absence from, or failure to propagate in, exposed localities [cf. preceding abstract].

Köhler (E.). **Untersuchungen über Synchytrium endobioticum (Schlussbericht).** [Studies on *Synchytrium endobioticum* (final report).]—*Z. PflKrankh.*, xlvi, 3–4, pp. 214–223, 3 figs., 1936.

In the first part of this paper the writer briefly describes and tabulates the cytological differences between *Synchytrium endobioticum* and *S. fulgens* [a parasite of *Oenothera lamarckiana* and *O. biennis* in Japan: *R.A.M.*, ix, p. 542], with special reference to azygote production in hanging-drop cultures [ibid., xi, p. 261]. In *S. fulgens*, according to Kusano, the female (resting) gametes assume an azygotic character unless they are immediately fertilized by a male partner, whereas in *S. endobioticum* a large excess of male gametes is available for the purpose of sexual union and consequently the development of the azygotic phase is exceptional. Under natural conditions, on the other hand, the number of azygotes in *S. endobioticum* normally exceeds that of zygotes, indicating that the mechanism of sexual alternation is influenced in some way by the host. A good medium for zygote cultivation was found to consist of 10 per cent. each of sea water and extract of manured soil, 0·3 N sodium thiocyanate, and 1 per cent. dextrose.

Lemmerzahl's method of artificial inoculation of potatoes with *S. endobioticum* [ibid., x, p. 335] consists in encircling the eyes with a strip of vaseline on which drops of distilled water are introduced through a pipette; superimposed on the water is a portion of a fresh, actively infective wart excrescence. The substitution for distilled water of solutions of potassium nitrate, sodium nitrate (each at 1·25 per cent.), or ammonium nitrate (2·5 per cent.) prevented the germination of the zoospores, and even at lower concentrations there was a marked reduction in the incidence of infection. In nature, therefore, the chemical composition of the soil will probably be the decisive factor in the development of the disease.

Inoculation experiments were carried out on a number of Solanaceae other than potato and positive results (gauged by the presence of mature or ripening sori) were obtained on *Schizanthus pinnatus*, *Solanum dulcamara*, tomato (Lucullus and Tuckswood varieties), *S. nigrum* vars. *macrocarpum* and *chlorocarpum*, *S. miniatum* and its vars. *viridicaule* and *rubricaule*, and *S. racemigerum*. In no case were the 'subinfections' characteristic of resistant potato varieties [ibid., xi, p. 69] observed, but in general the reaction of the test plants was considerably weaker than that of susceptible potatoes. In tomato, however, there was an occa-

sional formation of 'radial galls', while pubescence in the inoculated area was actively promoted, so that the epidermal cell infected by the sorus was surrounded by a peculiar crown of hair. In *S. miniatum* conspicuous epidermal swellings ('pearl galls') resulted from zygote (resting sporangial) infection, while in the same process *S. dulcamara* induced the formation of hemispherical protuberances on the stem surface.

Powell Jones (A.) & Moore (H. I.). **Cracking of Potato tubers.**—*Gdnrs' Chron.*, xcviii, 2256, pp. 445–446, 2 figs., 1935; xcix, 2569, p. 185, 1 fig., 1936.

Red King potato tubers in Yorkshire were found after harvesting in 1935 to show extensive cracking, the fissures frequently radiating from a common centre while occasionally a single furrow girdled the tuber [cf. *R.A.M.*, xi, p. 668]. The phenomenon, which appears to be associated with the excessive turgidity arising from a wet spell following a very dry growing season, was experimentally shown in preliminary tests on King Edwards to be increased by the sulphuric acid treatment for killing the tops against blight [*Phytophthora infestans*: ibid., xv, p. 45] when the tubers were dug immediately but not when lifting was delayed. The cracked tubers suffered from a severe form of fungal wet rot in storage, causing up to 15 per cent. loss.

Peppin (S. G.) & Hurst (R. R.). **Date of digging and its relation to the development of Rhizoctonia on Potato tubers.**—*Amer. Potato J.*, xiii, 3, pp. 74–76, 1936.

Experiments have been carried on at Charlottetown, Prince Edward Island, Canada, since 1924 to determine the connexion between date of lifting (from 1st September to 13th October) and the incidence of *Rhizoctonia* [*Corticium solani*] on Irish Cobbler (and in 1926 and 1935 also Green Mountain) potato tubers [*R.A.M.*, ii, p. 386]. The results to date show a steady and appreciable increase in the number of diseased tubers from week to week, the average amount of infection on Irish Cobblers being 2·33 per cent. on 1st September and 43·07 per cent. on 13th October, while the corresponding figures for Green Mountains are 0·2 and 39·55 per cent., respectively. The normal local digging date for Cobblers is about 20th September and for Green Mountains 1st October, and it is obvious from the results of these tests that harvesting should be expedited by one or more weeks according to the season.

Johnson (L. R.). **Trials of mercuric chloride for the prevention of Potato sickness.**—*Ann. appl. Biol.*, xxiii, 1, pp. 153–163, 1936.

In trials conducted over a four-year period to investigate the effect on potato sickness [*R.A.M.*, xi, p. 323] of mercuric chloride soil dressings it was found that, apart from the effect on the eelworm *Heterodera schachtii*, the tubers from plots receiving 1 gall. per sq. yd. of 1 in 250, 1 in 500, and 1 in 1,000 solutions were free from sclerotia of *Corticium solani* [commonly associated with the disease] and almost free from common scab [*Actinomyces scabies*], though these were abundantly present on the tubers from the untreated control plots. Treatment of the soil with mercuric chloride in powder form applied at the rates of 0·64 and 0·8 oz. per sq. yd. controlled collar rot and gave tubers free

from the fungus and from common scab. The mercuric chloride had a depressing effect on the early growth of the potatoes, but this effect is prevented by applying it 3 or 4 months before planting.

HÜLSEN. **Die Schwarzfleckigkeit (Blaukochen) bei Kartoffeln.** [Black spotting (blue cooking) in Potatoes.]—*Ernähr. Pfl.*, xxxii, 3, p. 55, 1 graph, 1936.

The writer briefly reports on some experiments conducted by L. Cools in Holland in 1934 to determine the relation of nutritional factors to the black spotting of potatoes and their blue discoloration on cooking [associated with melanin formation: *R.A.M.*, xii, p. 531]. Analyses by J. G. Maschhaupt showed that the potassium oxide content of the diseased tubers was extremely low in comparison with that of healthy ones, and the application of 600 kg. per hect. of 40 per cent. potash salts was necessary to bring it up to the requisite level and so prevent a recurrence of the trouble. Where potash was omitted from the fertilizing scheme the incidence of black spotting amounted to 75 per cent.

WAKSMAN (S. A.). **Humus: origin, chemical composition, and importance in nature.**—xi+494 pp., 45 graphs, London, Baillière, Tindall, & Cox, 1936. Price 30*s*.

The author in his foreword describes this treatise as an 'attempt to tell the story of humus, its origin . . ., its chemical composition, its physical properties, its importance in nature . . ., and finally its decomposition', particular stress being laid on the close connexion between humus and micro-organisms and on the part of the latter in its formation and transformation [cf. *R.A.M.*, xv, p. 51]. The very comprehensive and thoroughly documented work is divided into three parts: (A) historical development of our knowledge of the chemical nature of humus, its formation, and its role in plant nutrition; (B) origin and nature of humus; (C) decomposition of humus, its functions and applications. Scattered allusions to various points of mycological interest [ibid., x, p. 357; xiii, p. 117, *et passim*] are to be found in the last section of the work.

KARNICKA (HALINA) & ZIEMIĘCKA (JADWIGA). **Cellulose decomposition in acid soils.**—*Trans. third int. Congr. Soil Sci.*, iii, pp. 109–110, 1935.

In their study (details of which are reserved for future publication elsewhere) of the nature and activity of the micro-organisms concerned in cellulose decomposition [*R.A.M.*, xv, p. 174] in acid podsolized soils in Poland, the writers found that, at a P_H higher than 6·5, bacteria were almost exclusively occupied in this process, but at 6 to 6·5 moulds and certain actinomycetes also took part. Moulds were the principal agents of cellulose destruction in soils with a low humus content and a P_H less than 6. Applications of lime to the soil generally caused a diminution of fungal activity which was stimulated, on the other hand, by manuring with nitrogen. Thirteen species (including four of *Chaetomium*) [cf. ibid., xiii, p. 256; xiv, p. 237] were isolated from acid soils and only one (*Trichoderma lignorum*) [ibid., xv, p. 395] from a base-saturated, neutral soil. The Rossi-Cholodny technique [ibid., xv, p. 334] revealed the

occurrence of the following cycle in acid soils: cellulose is first attacked by fungi, followed by actinomycetes, and ultimately by bacteria which feed on the decaying hyphae or their products. In neutral soils, on the other hand, the attack is opened by bacteria and followed by the other groups.

Cholodny (N. G.). Исследование микрофлоры почвы путем проращивания почвенной пыли. [Investigation of soil microflora by means of soil dust germination.]—*Микробиол.* [*Microbiol.*], v, 2, pp. 159–166, 1 pl., 1936. [English summary.]

A new method is described for the examination of soil microflora in the live state [see preceding abstract]. A small quantity of dry soil dust, sifted through a metal sieve of very fine mesh, is evenly distributed over the surface of the centre of a cover slip, which is then placed (dusty side downwards) over the depression, containing a drop of distilled water, in a paraffined object slide. After several days in the thermostat at 23° to 24° C., the micro-organisms present in the dust begin to 'germinate', and form dense growths round the soil particles adhering to the glass, the cells being frequently arranged in the shape of a radial network of colonies at a fixed distance apart, the extent of which appears to depend on the amount of slime produced by the organisms. The exclusion of *Corynebacterium* from the soil population may be effected by the omission of paraffin from the slide. This method appears to be applicable to the detailed study of the autochthonous microflora of different soils for purposes of agricultural diagnosis, and experiments in this direction are in progress.

Vergovsky (V. I.). Ржавчина Мяты и способы борьбы с ней. [Peppermint rust and measures for its control.]—*Bull. méd. tech. Pl., Simferopol*, iii, pp. 5–54, 9 figs., 3 graphs, 1935. [English summary. Received April, 1936.]

This is a fully tabulated account of the author's studies from 1927 to 1932 on the rust (*Puccinia menthae*) [*R.A.M.*, xiv, p. 791] attacking peppermint (*Mentha piperita*) in the Ukraine, where it is stated to be widespread and annually to cause losses of 20 to 30 per cent. of the crop, and of as much as 50 per cent. in heavy rust years. It was shown that a moderate attack on the leaves results in lowering the yield in essential oil by 16 to 25 per cent., and that the oil obtained from diseased leaves contains less menthol (by 9 per cent. in one test) than that from sound leaves. In soils with low moisture content the rust may kill a large number of young peppermint shoots, while in sufficiently watered soil it causes hypertrophy of the stem tissues with no wilt.

In artificial infection experiments it was shown that only teleutospores that overwintered under natural conditions were capable of infecting the host. These spores are usually very abundant in the soil in peppermint-growing regions, but they can only attack the young plants before or just after their emergence from the soil, later growth being immune from infection. Adult leaves, on the other hand, are readily infected by the aecidio- and uredospores of the fungus. No evidence was forthcoming in confirmation of the view that the rust

overwinters in the form of mycelium in the roots of diseased peppermint plants, and spring renewal of the disease was found to be solely due to infection of the plants by the teleutospores in the soil. It was further shown that infection is not systemic, and that every new infection of the leaves is caused by inoculum from the air. Under controlled conditions the uredospores of *P. menthae* germinated best at temperatures between 15° and 20° C., but not at all below 10° or above 25°. In hot summer weather the development of the uredo stage is effectively controlled by the heavy development on it of *Darluca filum* [see above, p. 488].

Varietal resistance tests showed that the seven species of *Mentha* and nine seedling lines of *M. piperita* which were studied varied from immune to highly susceptible to the rust, and that uredospores collected on a given species or form exhibit a high degree of specialization to this host, but may, under especially favourable conditions, also attack other species of the genus. Pubescence of the stems and leaves appeared to be correlated with resistance in peppermint. While some of the hybrids studied showed immunity from, or high resistance to, the rust, and yielded an essential oil favourably comparing with that from the true peppermint, no clones of *M. piperita* were found combining resistance with commercial properties.

Applications of Bordeaux mixture against the rust do not yield satisfactory results, and the best method of control is by deep ploughing in (not less than 5 cm. deep) of the peppermint stubble early in the autumn, and by keeping the fallow clean throughout the winter and next spring. Root cuttings planted out in the field should be set at a depth of not less than 5 cm., sufficient to prevent the germination of the teleutospores that may be present on them. In years of heavy rust epidemics the peppermint should be harvested before the appearance of the teleutospores, i.e., before the onset of cooler autumn weather.

Storey (H. H.). **Virus diseases of East African plants. IV. A survey of the viruses attacking the Gramineae.**—*E. Afr. agric. J.*, i, 4, pp. 333–337, 9 figs., 1936.

Continuing his studies on virus diseases [*R.A.M.*, xv, p. 277] the author briefly surveys the viruses attacking Gramineae in East Africa, arranging them under the headings (1) common sugar-cane mosaic group, (2) Agaul mosaic, (3) streak group, (4) R.P. 8 group, (5) maize stripe, and (6) a new mosaic-like maize disease. The following points may be noted. Evidence is adduced indicating the existence of strains of the sugar-cane mosaic virus differing from the one commonly found [ibid., xiv, p. 123; xv, p. 319].

The Agaul sugar-cane variety in South and East Africa is affected by a mosaic disease, the virus of which was not transmitted by needle inoculations or *Aphis maidis*; further, there was no evidence that spread to other sugar-cane varieties had occurred. This virus is therefore tentatively separated from the first group.

The available evidence indicates that each host or group of hosts affected by streak carries a specialized strain of the virus [ibid., xi, p. 66], and recently another strain apparently specialized to maize has been recognized by A. P. D. McClean.

A streak disease of R.P. 8 sugar-cane was reported by Shepherd in 1929 [ibid., viii, p. 89] and a plant of this variety intercepted in quarantine in East Africa showed typical streak symptoms. Repeated attempts to transmit the virus to maize and healthy R.P. 8 and other sugar-cane varieties by means of *Cicadulina* spp. and *Peregrinus maidis* all failed, and the virus is accordingly regarded as distinct from the common streak.

A maize disease referred to as 'stripe', hitherto recognized in Africa only in the Amani district, so closely resembles streak [ibid., xv, p. 203] in its symptoms as often to be indistinguishable from it. Yellow stripes are formed along the veins, tending to be longer than those due to streak. Sometimes they are rather wide and separated by considerable areas of green tissue, while at other times they are narrow but so crowded that large areas of leaf become almost entirely yellow. The differential character is transmission by *P. maidis* [cf. ibid., vi, p. 438; vii, p. 159; xii, p. 756] and not by *Cicadulina*. The virus is not known to be transferable in East Africa to any other host. It is perhaps identical with that recorded by Kunkel and may possibly prove to be the same as R.P. 8 streak.

A new mosaic-like disease was produced in the greenhouse on maize seedlings exposed to the feeding of *Cicadulina* collected on maize near Amani. Newly unfolded leaves of recently infected plants show a diffuse blotching, which disappears as the leaf ages; in its later growth an affected plant may show no markings even on the youngest leaves. Owing to the transitory nature of the symptoms the disease has not yet been diagnosed with certainty in the field. The evidence obtained showed that it is due to a virus transmitted by the same species of *Cicadulina* as transmit streak [*C. mbila* and *C. zeae*: ibid., xiii, p. 571]. As the symptoms of the two diseases are so dissimilar it is, however, unlikely that the virus is merely an unusual strain of the streak virus. Unlike the other diseases mentioned in this paper it appears to have little effect on yield.

UNAMUNO (L. M.) **Algunas novedades micológicas de la flora española.** [Some mycological novelties of the Spanish flora.]—Reprinted from *XIV Congr. Asoc. esp. Progr. Cienc., 1934*, 21 pp., 6 figs., 1935. [Received June, 1936.]

Continuing his geographical and taxonomic studies on the Spanish mycoflora [*R.A.M.*, xv, p. 175], the writer gives an annotated list of fifty species, three of which are new and are furnished with Latin diagnoses. *Uromyces fabae* [ibid., xiv, p. 141] was collected in three new localities on cultivated vetch and broad beans, the latter crop being totally destroyed at Portichol, Alicante, in 1933. *Crataegus* leaves in Alicante were found to be infected by *Gymnosporangium clavariaeforme* [ibid., xiv, p. 533]. *Melampsora allii-populina* [ibid., x, p. 418] occurred on poplar (*Populus pyramidalis*) foliage in Santander. Barley grain in Badajoz was invaded by *Acremonium hordei* n.sp. characterized by simple, hyaline, usually curved conidiophores, 21·5 to 37·2 by 2 to 3 μ, bearing hyaline, ellipsoid to elongated, straight or curved conidia, rounded at both ends, 4 to 6 by 2·3 μ.

Viennot-Bourgin (G.). **Contribution à l'étude de la flore cryptogamique du Valais (Suisse).** [A contribution to the study of the cryptogamic flora of Valais (Switzerland).]—*Rev. Path. vég.*, xxiii, 1, pp. 33–77, 5 pl., 8 figs., 1936.

This annotated list comprises 93 fungi (chiefly rusts and smuts) found in a valley in Valais, Switzerland [cf. *R.A.M.*, xiv, p. 645].

Fraser (Lilian). **An investigation of the sooty moulds of New South Wales. III. The life histories and systematic positions of Aithaloderma and Capnodium, together with descriptions of new species. IV. The species of the Eucapnodieae. V. The species of the Chaetothyriae.**—*Proc. Linn. Soc. N.S.W.*, lx, 1–2, pp. 97–118; 3–4, pp. 159–178, 280–290, 195 figs., 1935.

Continuing her studies on the sooty moulds of New South Wales [*R.A.M.*, xiv, p. 60], the writer describes in part III of this paper her examination of the life-histories of four fungi, viz., *Capnodium salicinum*, *C. salicinum* var. *uniseptatum* n. var. on *Spartium* sp., *Aithaloderma viridis* n. sp. on *Elaeodendron australe*, and *A. ferruginea* n. sp. on *Citrus* sp., the new species and variety being furnished with Latin and English diagnoses. The author does not accept the transference of species of *Capnodium* to the later genus *Teichospora* [cf. ibid., xv, p. 25] nor does she consider Woronichin's order Capnodiales justified since these fungi show no feature which should exclude them from the Dothideales as defined by Miller.

In part IV further observations are made on *C. salicinum* and its var. *uniseptatum*, emended descriptions are given of the imperfectly known species, *C. walteri* [ibid., xiii, p. 187], *C. fuliginodes*, *C. anonae*, *C. mucronatum*, and *C. australe* [loc. cit.], and Latin and English diagnoses are provided for the following new species: *C. moniliforme*, *C. elegans*, *Henningsomyces affine*, *Limacinia concinna* and varieties, *C. fuliginodes* var. *grandisporum*, and *C. anonae* var. *obscurum*. *Scorias philippinensis*, recorded from the Philippines in 1932 [ibid., xi, p. 547], is reported for the first time from Australia. Three unidentified species of *Microxyphium* [ibid., xi, p. 404; xiii, p. 187] and two of *Caldariomyces*, the exact position of which is still obscure, are also described. The taxonomy of the sooty moulds herein recorded is discussed and observations are made on five common types of pycnidial fructification.

Part V deals with eight new species of the Chaetothyriae, viz., *Chaetothyrium fusisporum* (one of the hosts of which is *Acacia binervata*), *C. globosum*, *C. griseolum*, *C. peltatum*, *C. fuscum*, *C. strigosum*, *C. cinereum*, and *C. depressum* (on *Sideroxylon australe*), discusses the affinities of *C. loganiense*, records the detection of *C. roseosporum* (on *S. australe* and other hosts) for the first time in Australia, and gives supplementary notes on *A. ferruginea* and *A. viridis*.

Honey (E. E.). **North American species of Monilinia. I. Occurrence, grouping, and life-histories.**—*Amer. J. Bot.*, xxiii, 2, pp. 100–106, 4 diags., 1936.

This paper is stated by the author to be introductory to a series of studies of the North American species of parasitic fungi referable to his

genus *Monilinia* [*R.A.M.*, xv, p. 744]. He now suggests that the genus be divided into two sections, namely (I) the Junctoriae or Eumoniliniae, to include species that do not produce disjunctors between their macroconidia, and (II) the Disjunctoriae, to comprise those that produce these organs, which are described and illustrated diagrammatically. The two groups are also separable by the intensity of the specific aromatic odour developed by them, their host specialization, and their life-histories, which are represented diagrammatically. The most widely known representatives of the first group are *M.* [*Sclerotinia*] *fructicola*, *M.* [*S.*] *fructigena*, *M.* [*S.*] *laxa*, and probably *Phaeosclerotinia nipponica* [? *Lambertella corni-maris*: ibid., xiv, p. 774]. The second group contains the majority of the known species of *Monilinia*, including 12 species (3 new [without diagnoses] and 8 new combinations) reported from North America, and a number of species recorded under *Sclerotinia* from Europe and the Orient. *S. padi* is renamed *M. padi*.

GHIMPU (V.). **Afecțiunile patologice și inamicii Tutunului din România în 1935.** [Pathological disturbances and pests of Tobacco in Rumania in 1935.]—*Bul. Cultiv. Ferment. Tutun.*, xxiv, 4, pp. 410–418, 1935. [Received June, 1936.]

Notes are given on the virus, fungal, and bacterial diseases and insect pests affecting the Rumanian tobacco crop in 1935 [cf. *R.A.M.*, xii, p. 791], including ring spot (tobacco virus 10), mosaic (tobacco virus 1), spot necrosis (potato viruses 16 and 20), and aucuba mosaic (tobacco virus 6A), *Asterocystis radicis* [cf. ibid., vii, p. 202; xv, p. 323] causing damage in the seed-bed, and *Fusarium equiseti*, *F. scirpi*, and *Nigrospora oryzae* producing leaf spots.

BEST (R. J.). **Precipitation of the Tobacco mosaic virus complex at its isoelectric point.**—*Aust. J. exp. Biol. med. Sci.*, xiv, 1, pp. 1–13, 2 graphs, 1936.

The virus of ordinary tobacco mosaic (tobacco virus 1) from artificially infected Blue Pryor plants is precipitated from the clarified juice by adjusting the P_H value to between 3 and 4, with a maximum at 3·4, at which point, under suitable conditions, more than 99 per cent. of the virus may be precipitated [*R.A.M.*, xv, p. 404]. The precipitate constitutes about 0·3 per cent. of the clarified juice or 3 per cent. of the total solids of the crude juice, the average yield being 2 mg. per ml. of juice.

Relatively stable colloidal solutions of the precipitate are obtained by elution with buffer solutions of phthalate-phosphate-borate at varying hydrogen-ion concentrations between P_H 2·8 and 2·3 or between 4·5 and 7·5, the resultant solutions containing the whole of the precipitated virus. It is not possible by selective elution to separate the virus from the precipitate either on the acid or alkaline side of its isoelectric point. It is concluded from the evidence as a whole that the precipitate represents either the virus itself or a complex of virus with some fundamentally related substance present in the juice.

Precipitation of the virus from suspensions of the 'isoelectric' precipitate in a buffer solution of P_H 7 takes place in the same way as from the juice, with a maximum at 3·4. The juice of Dwarf Champion tomato

plants artificially infected by the tobacco mosaic virus behaves similarly, and maximum precipitation occurs at the same P_H value. The isoelectric point of the virus-complex may thus be taken as P_H 3·4±0·1. The precipitate reacted positively to protein tests, and desiccator-dried samples contained 14 per cent. nitrogen.

AINSWORTH (G. C.) & SELMAN (I. W.). **Some effects of Tobacco mosaic virus on the growth of seedling Tomato plants.**—*Ann. appl. Biol.*, xxiii, 1, pp. 89–98, 5 graphs, 1936.

In this study parallel series of healthy tomato seedlings and others inoculated with tobacco mosaic virus 1 [see preceding abstract] were grown at different times throughout a complete year, and the growth rate measured by determining the dry weights of the plants at convenient intervals. The results [which are tabulated] showed that there was a high negative correlation between growth rate and incubation period. The evidence also indicated that the relative effect of the virus on growth rate is the same in winter and summer in spite of seasonal differences in the rate of growth and the symptoms produced. One effect of the virus is to delay the hydrolysis of starch in the leaves, and this metabolic disturbance may account for the reduction in growth. The accumulation of insoluble products in the leaf would tend to depress assimilation and this slower hydrolysis to reduce the amount of material translocated [*R.A.M.*, xiii, p. 476]. The percentage water content of all parts of the plants infected with tobacco virus 1 was lower than that of the controls during the early stage of the disease, but tended to be higher later on.

HOGGAN (I[SMÉ]A.) & JOHNSON (J.). **Behavior of the ordinary Tobacco mosaic in the soil.**—*J. agric. Res.*, lii, 4, pp. 271–294, 1936.

After stating that preliminary tests showed that the virus of ordinary tobacco mosaic (tobacco virus 1) [see preceding abstracts] is readily leached from decaying infected plant tissues into the soil, where it is known to survive the winter [*R.A.M.*, ix, p. 207; xiii, p. 729], the authors give a tabulated account of greenhouse and laboratory experiments on the behaviour of the virus (added either as extract from infected plants or in finely divided tissues) in 27 representative samples of tobacco soils of the United States. An appreciable amount of virus contained in the extract was immediately inactivated after addition to certain soils, but in no case was the inactivation nearly as high as that caused by charcoal or other highly adsorptive substances. In moist soils no correlation could be established between the degree of inactivation and the physical character of the soil, but the virus was immediately, and usually completely, inactivated when the soil was desiccated, the rate and degree of inactivation during drying being to a considerable extent correlated with the physical properties of the soil. The degree of water saturation of the soil above a low minimum, and hydrogen-ion concentrations within the range that occurs naturally in the field, did not appear to affect the inactivation of the virus. Aeration, on the other hand, relatively slowly increased the rate of inactivation. While the rate of the process was not appreciably affected by soil temperatures between 5°

and 30° C., it was definitely greater at 40°. Freezing rapidly inactivated the virus in the soil, presumably because of the freezing-out of the soil moisture. Virus present in undecayed plant tissue was not appreciably inactivated either by desiccation or freezing, but desiccation of severely decayed tissue resulted in rapid inactivation of the remaining virus in it. In decaying moist plant tissues inactivation of the virus was gradual, considerable amounts of the virus remaining in the tissues until final disintegration. The rate of inactivation was definitely more rapid in certain soils than in others, and strikingly more rapid in pure sand than in field soils, for some reason which is not yet understood.

JENSEN (J. H.). **Studies on the origin of yellow-mosaic viruses.**—*Phytopathology*, xxvi, 3, pp. 266–277, 1 fig., 1936.

Further evidence was experimentally obtained that the yellow mosaic viruses originate in tobacco plants infected by tobacco mosaic (tobacco virus 1) [*R.A.M.*, xiii, p. 329; xv, p. 321], procured in these tests from a necrotic lesion on a leaf of *Nicotiana langsdorffii*. The attempts made to secure single infectious units of virus, by means of high-dilution single pin-puncture inoculations, ultrafiltration, and chemical treatments were apparently largely successful, since tobacco plants inoculated with the material so derived developed bright yellow spots from which yellow mosaic viruses were isolated. Many, if not all, of the 51 strains isolated from the diseased plants were judged, on the basis of variations in the symptoms induced, rates of movement, virulence, and other features, to be distinct, and there are marked indications that new strains of the tobacco mosaic virus arise suddenly in infected plants by some process akin to mutation. That the yellow mosaic viruses represent strains of the tobacco mosaic virus proper has been demonstrated by the peculiarity to both groups of certain characters, host reactions, and serological relationships [cf. ibid., xiv, p. 798].

THUNG (T. H.). **Infective principle and plant cell in some virus diseases of the Tobacco plant II.**—*Handel.* 7*de ned.-ind. natuurw. Congr.* [*1935*], pp. 496–507, 1 pl., 1936.

A tabulated account is given of the writer's continued studies on the virus diseases of tobacco in Java [*R.A.M.*, xi, p. 750], the experiments herein described being concerned with the immunizing effects of ordinary tobacco mosaic (A), mild mosaic (B), white mosaic (C), ring spot necrosis (D), yellow bleaching tobacco ring mosaic (E), severe mosaic (F), distorting mosaic 1 (G), speckled mosaic (H), Holmes's masked strain of tobacco mosaic (I), streak [see next abstract] (J), and Holmes's distorting strain [ibid., xiv, p. 61] (K).

In presenting the results an attempt has been made to express the different leaf symptoms in formulae composed of capital letters and figures, e.g., an ordinary mosaic leaf is represented by $A_1A_2A_3A_4$, 1 meaning leaf form, 2 mosaic pattern, 3 the predominating, and 4 the second colour. To express a mixed pattern in which either of the component viruses is to be reisolated the + sign is used, e.g., $\frac{1}{2}A_1A_2A_3A_4+\frac{1}{2}C_2C_3C_4$ for a leaf affected by ordinary mosaic combined with white. The fraction implies the portion of the lamina estimated to be occupied

by the pattern in question. The predominating virus in a mixture is placed first in the formula. In cases of mixtures of two viruses in which only one of the components is to be reisolated, the × sign is used, e.g., $G_1G_2 \times C_3C_4$, meaning that the leaf form and pattern are of the distorting mosaic type 1 (G) and the typical colour white (C), the former predominating and the latter to be reisolated. Various other conventions are indicated.

The capacity of the different viruses for penetration into already diseased plants and the resistance of the latter to reinvasion were found to vary greatly. Of the viruses not inoculable by *Myzus persicae*, ordinary and white mosaic are the strongest both in infective capacity and resistance, a correlation between these two characters being apparently established. More powerful still are the speckled mosaic and streak viruses, both transmissible by *M. persicae*, which are able to invade even ordinary mosaic. The speckled mosaic in such cases is invisible, but its presence is demonstrable by means of the aphid. When a plant with distorting mosaic is invaded by the white virus, the leaves formed after the second inoculation assume the shape and pattern of the distorting mosaic, but the dominant colour is white. An inoculation with the juice of this mixture produces only white mosaic, but an inoculation of the distorting mosaic at least 24 hours before infection by the white obviates the suppression of the former by the latter. Although speckled mosaic is dominated by distorting in the visible leaf symptoms, the inoculation of a mixture of both juices results in domination of the distorting only on some 20 per cent. of the plants. In general, the inoculability of the latter virus is comparatively low, infection frequently occurring only on 70 or 80 per cent. of the inoculated plants after an unusually lengthy incubation period.

Immunizing characters are useful in the differentiation of certain viruses, e.g., ordinary tobacco mosaic, Holmes's distorting strain, and the writer's distorting mosaic 1. The patterns of the two first-named are similar and the distorting effects of the second are practically absent in Java, but the immunizing characters are different. Thus, ordinary mosaic gives complete immunization against white mosaic three to four days after inoculation and is not dominated by streak. Holmes's distorting mosaic takes much longer—up to ten days—to confer immunity from white mosaic and is entirely dominated by streak. The writer's distorting mosaic affords no immunity at all.

A retardation in the development of the symptoms of white mosaic, particularly the more pronounced, was observed on plants already inoculated with other viruses, amounting to 1 to 3, 5, 5, 7, and 9 days, respectively, for distorting and speckled mosaics, Holmes's masked strain, severe mosaic, and ring spot.

Most of the viruses used in these tests confer no immunity from white mosaic or ring spot, but after a second inoculation with ordinary mosaic plants affected, e.g., by severe or distorting mosaic, will not contract other viruses on a third inoculation, since the ordinary mosaic becomes systemic in such plants and presumably the plant cell infected by different viruses retains the immunizing properties of each. Plants with a combination of either severe or distorting mosaic, and ring spot are not susceptible to white mosaic, immunity from which, however, is not

conferred by any of the three separately. It would thus appear that the several immunizing effects of these virus combinations are cumulative.

In mixed infections of severe and white mosaic attempts to inoculate the parts affected only by severe mosaic with ring spot gave negative results, a fact attributed by the writer to a blocking element developed under the influence of the white mosaic and found in other cells of the leaf besides those infected with the virus in question. Patterns of the latter disease on plants previously inoculated with ordinary mosaic are more or less prominent according to the length of time elapsing between the inoculation with ordinary mosaic and the introduction of the white virus, no symptoms of the latter developing after a delay in inoculating of four days.

On the basis of the foregoing experiments the writer briefly develops the following hypothesis: each of the inoculated viruses induces in the tobacco plant the formation of a non-infectious averting principle or immunizing substance against other viruses. The sap-transmissible group of viruses appears to produce one kind of averting principle and the aphid-transmissible group another sort.

JOHNSON (J.). **Tobacco streak, a virus disease.**—*Phytopathology*, xxvi, 3, pp. 285–291, 3 figs., 1936.

Tobacco streak [*R.A.M.*, xiii, p. 61] is stated to be a relatively uncommon disease which was long thought to be of non-parasitic origin but has now been shown by the writer's experiments in Wisconsin to be caused by a virus.

Under field conditions the symptoms are most prominent on the basal part of the middle leaves, which show irregular markings in the shape of spots, lines, or circles, with or without uniform patterns. The affected foliage may be considerably dwarfed and ragged, but is rarely or never entirely destroyed or shed in the field. The plants tend to recover to the extent that the upper leaves may show no symptoms whatever. In the greenhouse the leaves on young inoculated plants may almost succumb but eventually regain turgidity. Vein-clearing, followed by water-soaked systemic necrosis, may develop on new leaves three days after inoculation. Recovered plants on reinoculation show only vein-clearing and mild mottling, these slight reactions apparently indicating the acquisition of resistance to the more severe forms of the disease.

The virus collected from five fields in September, 1934, was readily transmitted to young greenhouse plants by the rubbing method of inoculation, but negative results have so far been obtained in experiments with insects, although the localization of infection near the borders suggests the implication of the latter in the spread of streak. The disease does not appear to be seed-borne. It was successfully conveyed in greenhouse trials to *Nicotiana rustica*, *N. glutinosa*, *N. tabacum* × *N. glutinosa* hybrid, *Datura stramonium*, *Nicandra physaloides*, and *Physalis pubescens*; tomato, potato, eggplant, and pepper (*Capsicum annuum*) were not attacked. The virus is inactivated by ageing for 24 to 36 hours at 22° C., its thermal death point is 53° (ten minutes' exposure), and probably does not survive a dilution beyond 1 in 30. It is clear, therefore, that the streak virus is very sensitive to external

conditions and is not likely to be perpetuated to any extent from year to year in the absence of vegetative propagation of its host.

Of the several virus diseases of tobacco recorded in recent years 'vein streak' [ibid., ix, p. 615] of Sumatra approximates most closely to the one here described, but other diseases not very definitely distinguishable from it on the evidence at present available include Rotterdam B disease [ibid., xv, p. 403], curl [ibid., xv, p. 118], stripe and curl [ibid., x, p. 562], and tobacco etch [ibid., xiv, p. 685].

SATTLER (F.). **Zur Biologie von Thielavia basicola (B. et Br.) Zopf.** [On the biology of *Thielavia basicola* (B. & Br.) Zopf.]—*Phytopath. Z.*, ix, 1, pp. 1–52, 15 figs., 1936.

Experiments were carried out in 1932–3 under controlled conditions at the Bonn-Poppelsdorf Agricultural Institute to determine the influence of soil moisture, temperature, carbon dioxide content of the air, light, nutrition, mechanical weakening, and soil constitution on the infection of various hosts by *Thielavia* [*Thielaviopsis*] *basicola* [*R.A.M.*, xv, p. 263, and above, p. 467] and on the symptoms induced by the fungus.

The amount of soil moisture was found to be directly proportional to the extent of the injury caused, the virulence of the symptoms on beans (*Phaseolus vulgaris*) and tobacco increasing parallel with a rise in the moisture content from 30 to 90 per cent. Both beans and lupins (*Lupinus angustifolius*) suffered heavier damage at 20° to 23° than at 25° to 28° C., indicating that the fungus inflicts the maximum injury at or near its optimum for growth [ibid., xii, p. 513]. The symptoms of infection by *T. basicola* on beans were most severe just above the optimum concentration for the plants of atmospheric carbon dioxide, i.e., 2·5 per cent. Drastic shading promoted such virulent attacks of *T. basicola* on beans as completely to destroy the plants, while the partial withdrawal of light produced comparable but less serious effects; tobacco, on the other hand, appeared rather to benefit from the latter course, acquiring temporary resistance to infection. Excess or deficiency of nitrogen and excess of potash led to the heaviest damage by the fungus on beans, lupins suffering most severely from excess potash. All types of soil either naturally poor in organic material, or in which the latter has been destroyed by sterilization, indirectly stimulate the pathogen to increased virulence by eliminating normal competition, and in pure sand the fungus is literally forced to adopt a parasitic mode of life in the absence of any other means of nutrition. Severe root infection by *T. basicola* necessarily involves the death of the host, but in milder cases the formation of adventitious roots permits the plant to withstand the parasite.

The occurrence of physiologic specialization within *T. basicola* was demonstrated by inoculation experiments on tobacco, beans, and lupins with collections of the fungus from the United States and Germany, the first-named host reacting positively only to American strains isolated from tobacco, while the other two (except *L. albus*) were infected by the bean (*P. multiflorus*) and *Cyclamen* [ibid., ix, p. 387] strains from Germany and by that of *Primula obconica* from Holland [ibid., xiii, p. 771] but not by the tobacco collections. In saprophytic culture the pathogen

undergoes a decrease of virulence, but its aggressive properties may be restored by transference to the living plants.

CLAYTON (E. E.). **Water soaking of leaves in relation to development of the wildfire disease of Tobacco.**—*J. agric. Res.*, lii, 4, pp. 239–269, 9 figs., 1936.

The results of the investigations described at length in this paper showed that the late-season, destructive type of tobacco leaf spot associated with wildfire (*Bacterium tabacum*) [*R.A.M.*, xv, p. 179] which is prevalent in the Maryland–Pennsylvania tobacco-growing area, almost exclusively after heavy rain-storms, is primarily caused by the development in the leaves of more or less extensive water-soaked areas due to the flooding of the intercellular spaces, in which the bacteria multiply and spread with considerable rapidity. In controlled experiments it was shown that, whereas in the normal tobacco leaf the 'halo' type of lesion took about a week to develop, water soaking induced the formation of the large, destructive lesions in 48 hours, and increased the size of the usual lesions by more than 6,000 per cent. Persistence of the water-soaked areas for at least 24 hours was, however, essential for the development of this form of the disease. It was further experimentally shown that water-soaking only results under the impact of hard-driven rain or spray, especially on the lower surface of the tobacco leaves; the susceptibility of the leaves is, however, modified by many factors, this accounting for the wide differences usually observed in the damage done by the disease. Mature basal leaves became more easily water-soaked than the young top leaves on the same plant; low topping increased the susceptibility of the leaves, while high or no topping had the opposite effect; high nitrogen and low potash fertilization also rendered the leaves more liable to be water-soaked.

These results are interpreted as indicating that susceptibility or resistance of tobacco to *Bact. tabacum* is a question of water relations, and that the halo form of the disease is the response to infection of the normal leaf, while the destructive type is the response of the leaf after its natural resistance has been broken down by water-soaking.

RUSSELL (T. A.). **Diseases and pests of Tomatoes in Bermuda.**—*Trop. Agriculture, Trin.*, xiii, 3, pp. 71–78, 1 pl., 1936.

A brief account is given of the pests and fungal and bacterial diseases of the tomato which have been so far recorded in Bermuda; the diseases discussed comprise *Fusarium* [*bulbigenum* var.] *lycopersici* [*R.A.M.*, xv, p. 406], *Septoria lycopersici* [loc. cit.], *Cladosporium fulvum* [see above, p. 522], *Sclerotinia sclerotiorum* [ibid., xiii, p. 356], *Bacterium vesicatorium* [ibid., xv, p. 63], *Rhizoctonia* [*Corticium*] *solani* [ibid., xiv, p. 263] (which occurs chiefly if not entirely on fruit that has rested on the ground), *Phoma destructiva* [ibid., xv, p. 265] (which may be so severe that sound fruit is hardly to be obtained), *Phytophthora infestans* [ibid., xv, p. 405], leak (apparently due to *Bacillus aroideae* following insect or other injury to the fruit) [ibid., xiii, p. 194], and the non-parasitic diseases blossom-end rot [ibid., xv, p. 406], splitting of the fruit, and sunburn.

RYAKHOVSKI (N. A.). Установление вредоносности болезней Помидор и разработка способов борьбы с ними. [Determination of the injuriousness of Tomato diseases, and elaboration of methods for their control.]—*Pl. Prot. Leningrad, 1935*, 3, pp. 88–91, 1935. [Received May, 1936.]

The author states that since 1929, when it was first recorded in the governments of Voronezh and Kursk, south Russia, tomato leaf curl [*R.A.M.*, x, p. 493] has become one of the major troubles of the crop in that region, where it frequently reduces the yield in marketable fruit by from 30 to 80 per cent. It was experimentally shown that the disease is not transmitted to healthy tomato plants by suckering, needle punctures, rubbing healthy leaves or stems with diseased juice, or by aphids; in the greenhouse, however, 27·4 per cent. infection resulted when healthy tomato seedlings were sprayed with juice extracted from diseased plants. Plants raised from seed obtained from diseased tomato plants gave 98·3 to 100 per cent. infection, while seedlings raised in neighbouring plots from healthy seed showed from 0 to 1·3 per cent. leaf curl, demonstrating that the disease is nearly always carried by the seed. Varying the dates of sowing, density of stand, crop rotation, and mulching did not affect the incidence and development of leaf curl, and the only means of control is the use of seed carefully selected from healthy tomato plants.

White leaf spot (*Septoria lycopersici*) [see preceding abstract] of tomatoes is equally widespread in both governments, where, in severe outbreaks, it accounts for as much as half of the crop. Experiments showed that it may be controlled by periodically spraying the plants with 0·5 or 1 per cent. Bordeaux mixture both before and after transplanting the seedlings from the greenhouses; other control measures recommended are strict sanitation of the greenhouses, crop rotation, weeding the tomato fields, and deep ploughing in of the fields in the autumn.

MAGEE (C. J.). **Spotted wilt disease of Lettuce and Potatoes.**—*Agric. Gaz. N.S.W.*, xlvii, 2, pp. 99–100, 118, 4 figs., 1936.

Spotted wilt is stated to have been more prevalent in New South Wales during the spring and early summer of 1935 than for several years past [*R.A.M.*, xv, p. 280], the destruction of the tomato crop being particularly extensive, while lettuce [ibid., xiv, p. 404] and potatoes have also suffered severely (15 to 25 per cent. infection in the former and 10 to 50 per cent. in the latter crop). In lettuce the first symptom is a general yellowing of the plant, accompanied by the appearance of brown, irregular, slightly depressed lesions on both the upper and lower surfaces of the central leaves, while the outer foliage tends to droop and to grow abnormally slowly. Later the centres of the spots collapse and assume a parchment-like consistency. These symptoms are often unilateral. In old plants a mosaic-like mottling may develop in the lower leaf axils. On potato plants the disease takes the form of numerous circular, brown, frequently zonate, necrotic areas on the upper leaves and longitudinal dead lesions on the stem apices, while in addition to these features some of the tubers show brown areas in the flesh; growth is arrested and yields reduced. Control of spotted wilt on lettuce and

tomato is likely to present considerable difficulty, but may be facilitated by regular inspections and systematic removal of diseased material.

GÖPFERT (J.). **Bekämpfung der Krautfäule bei Tomaten.** [Control of Tomato blight.]—*Obst- u. Gemüseb.*, lxxxii, 3, pp. 43–44, 1 fig., 1936.

In 1935 Standard (Original) tomato seed was dusted with ceresan and sown in the greenhouse on 4th March. The resultant seedlings were twice sprayed against late blight (*Phytophthora infestans*) [*R.A.M.*, xv, p. 324] with 1 per cent. Wacker's Bordeaux mixture and planted out on 24th May; on 8th June and 1st and 24th July the same preparation was applied to three plots of 100 sq. m. each at concentrations of 1, 1·5, and 2 per cent., respectively, while a fourth was given Wacker's copper dust and a fifth left untreated. The following yields were obtained: untreated, 462 kg. (estimated market value M. 92·40); 1, 1·5, and 2 per cent. Bordeaux, 570, 536, and 606 kg. (M. 114, 107·20, and 121·20, respectively); and dusted 550 kg. (M. 110). The 2 per cent. Bordeaux mixture gave practically complete control of the disease.

SEATON (H. L.) & GRAY (G. F.). **Histological study of tissues from greenhouse Tomatoes affected by blotchy ripening.**—*J. agric. Res.*, lii, 3, pp. 217–224, 9 pl. (1 col.), 1936.

The results of the histological studies reported in this paper support the view that the condition in greenhouse tomato fruits known as blotchy ripening [*R.A.M.*, xiii, p. 663] is primarily caused by the withdrawal of the water from the fruit during periods of excessive transpiration, occurring two to five days before the fruit ripens. This was indicated by the collapse in affected areas of the maturing ovary walls of the parenchyma cells near or adjacent to the vascular bundles. Blotchy ripening is stated to be prevalent throughout the north-central United States in the spring crop in greenhouses, but to occur rarely in the field and then only during drought periods. It is not of economic importance in the tomatoes that mature from October to January.

GRIEVE (B. J.). **Effect of inoculation of plant stems with Bacterium solanacearum.**—*Nature, Lond.*, cxxxvii, 3465, p. 536, 1936.

In an experimental study at Melbourne University of two primary reactions of tomato and other plants to invasion by *Bacterium solanacearum*, viz., petiole epinasty and adventitious root production, the former symptom was found to be confined to the lower petioles irrespective of the site of inoculation at the top or bottom of the stem. A condition for the development of epinasty appears to be the invasion of only one lateral petiolar or one lateral and the small central petiolar bundle, wilting without epinasty being the sequel to infection of all three bundles. The epinasty is permanent and is usually followed two to ten days later by wilting. The increased growth on the upper side of the petiole is believed to be generally due to the local activity of the bacteria. Petiole epinasty caused by *Bact. solanacearum* has also been observed in potato, African marigold [*Tagetes erecta*], and castor oil [*Ricinus communis*], the reaction of the first-named being particularly well-defined and rapid. Other factors besides stimulation are thought

to be involved in the formation of adventitious roots in infected tomatoes. A substance has been obtained from *Bact. solanacearum* that stimulates this process in tomato [cf. *R.A.M.*, xv, p. 81] and *T. erecta*, but evidence is accumulating to show that in the former partial blockage of the vascular system also plays an important part.

LUTZ (L.). **Sur la dégénerescence gommeuse des bois dans la nature.** [On the gummy degeneration of woods in nature.]—*Bull. Soc. mycol. Fr.*, li, 3–4, pp. 348–350, 1935.

A systematic search in widely separated parts of France for living and felled trees showing gum exudation associated with fungal parasitism gave a total of 38 fungi (including many Polypores, *Stereum purpureum*, and *Coniophora cerebella* [*C. puteana*]) on 27 tree varieties. In most cases the wood was rotting, and showed cavities either filled or soaked with water, or else the sap was rising and the tissues in consequence were saturated with water. Gumming is considered to be a general phenomenon, dependent upon the degree of saturation of the wood attacked [cf. *R.A.M.*, x, p. 700].

MÜNCH (E.). **Das Erlensterben.** [The dying-off of Alders.]—*Forstwiss. Zbl.*, lviii, 6, pp. 173–194; 7, pp. 230–248, 13 figs., 1936.

The writer describes and discusses, mainly from the silvicultural standpoint, an extensive dying-off of alders in various parts of Germany. The disease is characterized by a die-back of branches and stems, generally proceeding from the crown, and sometimes even from the twigs; it begins to be noticeable at the age of about twelve years and continues until the death of the trees some eight years later. It is preceded by an altogether exceptional precocity and fertility, with a tendency to unshapely development of the stem and crown. *Valsa oxystoma* and other wood- and bark-inhabiting fungi were constantly associated with the trouble, but negative results were given by inoculation experiments with the first-named, the rôle of which in the etiology of the die-back remains for the present obscure. It is thought that the disease was introduced with plants and seed imported from a restricted area in the Malines district of Belgium where the trees show the tendency to precocious fertility.

LANDALUZE (P. U.). **Hacia la solución del problema del Castaño.** [Towards the solution of the Chestnut problem.]—38 pp., 1 diag., 3 maps, La Coruña, Papelería e Imprenta Lombardero, 1936.

An account is given of the life-history and mode of infection of the ink disease of chestnut (*Phytophthora cambivora*) [*R.A.M.*, xv, p. 408], with observations on its distribution and economic importance in Spain and on the possibilities of its control. In the province of Coruña, the disease has reduced the number of chestnuts from 664,000 25 years ago to 104,000, while the values of the annual yields of nuts and timber, and capital represented have sunk, respectively, from 1,992,000 to 312,000, from 332,000 to 52,000, and from 46,480,000 to 7,280,000 pesetas [1 peseta = about 9½*d.* at par]. In many districts the inhabitants are reduced to destitution through the loss of this valuable source of revenue.

During the last two years promising results have been given by a preventive treatment involving the decortication of the trunks and thick roots, which are then washed with water, preferably with the addition of an adhesive, e.g., honey, calcium caseinate, or the proprietary product ipem, prior to spraying with copper carbonate. This economical method should also be tested against other root diseases, such as root rot of vines and fruit trees (*Armillaria mellea*) [ibid., xv, p. 75] and *P. citrophthora* [ibid., xiii, p. 25] on citrus, both prevalent in Galicia. The spread of *P. cambivora* appears to be largely impeded by very low temperatures such as occur in parts of Galicia.

BRAMBLE (W. C.). **Reaction of Chestnut bark to invasion by Endothia parasitica.**—*Amer. J. Bot.*, xxiii, 2, pp. 89–94, 6 figs., 1936.

Details are given of the author's histological studies of the infection of the American native chestnut (*Castanea dentata*) by *Endothia parasitica* [*R.A.M.*, xiv, p. 800]. In agreement with the observations of earlier investigators, it was found that primary invasion of the bark apparently occurs through a cleavage of cells effected by mass action of the fan-shaped mycelial mats of the fungus, which accumulate in wounds before entering the surrounding healthy tissues. Secondary invasion is effected by individual hyphae which penetrate a few mm. in advance of the mycelial mats. The walls of the host cells lying in the path of the mats or adjacent to the latter become partially lignified, but this process does not appear to impede the progress of the fungus. In the bark of vigorous chestnut stems and also below hypertrophied or swollen cankers a wound periderm was observed to develop between infected and sound areas; this periderm differs from normal secondary periderm of chestnut bark in time of formation, the proportion of thin-walled to thick-walled cork cells produced in the phellem, and in the larger number of layers of cells constituting the phelloderm. Although the efficacy of the periderm is not yet fully determined, it is suggested that its formation may have a bearing on the resistance of chestnut to infection by *E. parasitica*.

BUISMAN (CHRISTINE). **Verslag van de onderzoekingen over de Iepenziekte, verricht in het Phytopathologisch Laboratorium 'Willie Commelin Scholten' te Baarn gedurende 1935.** [Report on the investigations relating to the Elm disease conducted in the 'Willie Commelin Scholten' Phytopathological Laboratory, Baarn, during 1935.]—*Tijdschr. PlZiekt.*, xlii, 2, pp. 21–44, 1936.

A tabulated account (preceded by some introductory observations on pp. 17–20 by Dr. J. Westerdijk) is given of the inoculation tests performed during 1935 at various experimental nurseries in Holland to determine the reaction of European and Asiatic elms to *Graphium* [*Ceratostomella*] *ulmi* [*R.A.M.*, xv, p. 125]. On the whole, the results obtained with the European specimens were not very encouraging though further studies are necessary before a final verdict can be reached [cf. ibid., xv, p. 183]. Of the Asiatic varieties, *U. wallichiana* for the first time showed a trace of infection, whereas *U. pumila* maintained its high degree of resistance [ibid., xiv, p. 726].

C. ulmi was experimentally shown to pass from old to new wood only in a very few instances in the seedlings and suckers of *U. foliacea* and *U. glabra*, but in older trees the percentage would appear to be considerably higher [ibid., xv, p. 327]. The fungus was found to move with great rapidity through the wood of growing branches even of the resistant varieties, *U. pumila* and *U. foliacea* No. 24 (100 and 80 cm., respectively, upwards from the site of inoculation after 19 days); in cut branches the progress was noticeably slower, indicating that the water stream probably aids in the dissemination of the organism. It was ascertained by means of the fluometer devised by Melhus *et al.* for the study of water-flow interference in gall and vascular diseases [ibid., iv, p. 234] that the structure of the wood, even in resistant varieties such as *U. pumila*, presents no barriers to penetration by the spores of *C. ulmi*.

SPAULDING (P.), GRANT (T. J.), & AYERS (T. T.). **Investigations of Nectria diseases in hardwoods of New England.**—*J. For.*, xxxiv, 2, pp. 168–179, 1 diag., 1936.

An account is given of the results to date of the writers' extensive field and laboratory investigations, initiated in 1933 and still in progress, on the *Nectria* diseases of hardwoods in New England [*R.A.M.*, xiv, p. 338]. Perithecial development was found to be closely dependent on moisture relations. Both at 65° to 85° and 35° to 40° F. many more perithecia were produced and likewise became exhausted in a moist than in a dry state, the process of exhaustion being most rapid, however, when damp and dry conditions alternated. Even after a year in a dry atmosphere the perithecia may still contain viable ascospores.

Nectria cankers are prevalent on red maple [*Acer rubrum*], yellow birch [*Betula lutea*], sweet birch [*B. lenta*], and to a somewhat lesser extent on grey [*B. populifolia*], and paper [*B. alba* var. *papyrifera*] birches, sugar [*A. saccharum*] and mountain [*A. spicatum*] maples, red and black oaks [*Quercus rubra* and *Q.* (?) *velutina* Lam.] and largetooth aspen [*Populus grandidentata*]. In general, the fruiting of the *N.* species concerned is restricted to a limited area of the cankers, often on the callus ridge at the outer edge. The data from cross-inoculation experiments with monospore cultures from a number of hardwoods show that 'weed' trees, such as mountain and striped maple [*A. pennsylvanicum*], may be infected by inoculum from their more valuable neighbours, so that they probably act as agents in the dissemination of the disease.

In 1934 *N.* perithecia were found on 209 out of 1,785 beech trees (12 per cent.) examined in eastern Maine, the species involved being chiefly that described by Ehrlich (*N. coccinea* var.: ibid., xiii, p. 732]. Strong evidence was obtained that the maximum damage to the trees is generally inflicted by a combination of *Nectria* infection and scale infestation, but the correlation between these two forms of injury was not entirely uniform or consistent either in Maine, Massachusetts, or Connecticut.

Some practical silvicultural recommendations, based on the foregoing observations, are made for the control of *N.* cankers in the areas covered by these studies.

Finch (A. H.). **Zinc and other mineral constituents in relation to the rosette disease of Pecan trees.**—*J. agric. Res.*, lii, 5, pp. 363–376, 1 diag., 3 graphs, 1936.

In experiments carried out in 1933 near Tucson, Arizona, on Burkett pecan [*Carya pecan*] trees severely affected by rosette [*R.A.M.*, xiv, pp. 538, 767], zinc sulphate was introduced through holes bored in the trunk or in various branches, and detailed chemical analyses were subsequently made of the leaves and shoots. The results [which are tabulated] furnish additional evidence that the disease is to a considerable extent associated with deficiency in zinc; the development of the symptoms of the trouble, however, may also be influenced by such factors as condition of growth, location of the tree, exposure to light and heat, and probably many more. While the total ash content of leaves collected from the top of rosetted and healthy trees in the Yuma Valley in 1934 was found to be higher in the former than in the latter, it could not be definitely correlated with rosette, since it is also markedly affected by other factors; the zinc content varied from a trace to 0·0071 per cent. and from 0·0084 to 0·0202 per cent., respectively. Ringing the tree did not prevent the passage of zinc, which must be translocated in the xylem; when introduced directly into this tissue it moved most rapidly in an acropetal direction.

Owens (C. E.). **Studies on the wood-rotting fungus Fomes pini. I. Variations in morphology and growth habit.**—*Amer. J. Bot.*, xxiii, 2, pp. 144–149, 9 pl., 1936.

In this paper the author summarizes the results of his studies on the growth habit and morphology of the sporophores of *Fomes pini* (which name he prefers to *Trametes pini*) [*R.A.M.*, xiv, p. 67; xv, p. 472] collected from six genera and 21 species of coniferous trees in North America, chiefly in Oregon and other areas of the Pacific North West. Considerable variations were observed in the shape and size of the fruiting bodies (thin, shell-shaped to thick ungulate, ranging from 1 in. or less to 17 in. in the broadest dimension) and of the pore mouths (circular or angular to labyrinthiform, ranging from 0·25 mm. for the smallest circular pores to 2 by 9 mm. for the largest daedaloid pores), not only on different host genera and species but also on a single host species. Variations were also recorded in the size of the spores from different hosts; thus, for instance, on *Picea sitchensis* the spores averaged 5·1 by 4·6 μ, on *P. rubra* 4·4 by 4 μ, and on *Pinus monticola* ranged from 5·2 to 5·7 by 3·6 to 4·9 μ. On living trees in the Pacific North West the sporophores were always found at the branch stubs or knot holes on all the species of hosts investigated, except on *Abies grandis*, on which they occur gregariously in large numbers, scattered over extensive canker-like areas of the bark; in Oregon there was ample evidence that the sporophores on this species persist and develop new layers throughout several growing seasons, and on *Picea sitchensis* the sporophores are large and perennial. In variance with existing records in eastern North America and in Europe, no strictly annual sporophores of *T. pini* were observed in the Pacific North West on any species of host tree.

Rumbold (Caroline T.). **Three blue-staining fungi, including two new species, associated with bark beetles.**—*J. agric. Res.*, lii, 6, pp. 419–437, 10 figs., 1936.

In continuation of her studies on the blue-staining fungi associated with bark beetles parasitizing conifers in the United States [*R.A.M.*, xi, p. 340], the author states that *Ceratostomella ips* [ibid., xiv, p. 729] has now been found to be associated with the bark beetles *Ips emarginatus*, *I. integer*, and *I. oregoni*, which attack conifers on the Pacific coast. An account is further given of cultural studies of two hitherto undescribed species of *Ceratostomella*, which were found to be associated with the beetles *Dendroctonus pseudotsugae* on Douglas fir (*Pseudotsuga taxifolia*) and larch (*Larix occidentalis*), in Washington and Oregon, and *D. piceaperda* on spruce (*Picea glauca*) in eastern Canada, respectively. The first, which is named *C. pseudotsugae* [with a Latin diagnosis], has hyaline, globose, obovoid or clavate conidia, 2·7 to 5 by 1·4 to 2·7 μ, first solitary and later in clusters, on hyaline, usually unbranched conidiophores. The perithecia are black, globose, slightly hirsute, 45 to 140 by 42 to 140 μ in width, with a beak measuring 20 to 160 by 10 to 25 μ. The ascospores (eight) are hyaline, crescent-shaped, 2·4 to 5·4 by 0·9 to 2·4 μ. The second, *C. piceaperda* n.sp. [with Latin diagnosis], has erect, brown, branched conidiophores, 170 to 250 by 4 to 8 μ, bearing hyaline, obovoid or clavate conidia, 3 to 11 by 2 to 4 μ, aggregated in heads. The perithecia are black, globose, hirsute, 90 to 350 by 80 to 340 μ, with a beak measuring 110 to 980 by 25 to 45 μ. The ascospores (eight) are hyaline, ellipsoid, and measure 3·6 to 4·7 by 1 to 2·4 μ.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Service and regulatory announcements, October–December, 1935.—pp. 1–2, 1936.

An announcement (B.E.P.Q. 385, superseding P.Q.C.A. 320 (2nd revision) and Supplement No. 1), dated 1st November, 1935, enumerates (A) the barberries (*Berberis thunbergii* and its varieties) immune from rust [*Puccinia graminis*] in respect of which (as for *Mahonia* cuttings for decorative purposes only), no permit is required for inter-State movement between 13 protected States [*R.A.M.*, xiv, p. 672], (B) those sufficiently resistant to the disease for distribution under permit in the spring wheat area, and (C) those of species and varieties to be excluded from the latter on the grounds of susceptibility to black rust (i.e., any not falling within groups (A) and (B)).

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, x, 3, p. 54–55, 1936.

Brazil. An Order of 12th September, 1935, provides for the phytosanitary inspection of fruit crops by the Service of Plant Health Protection, which will issue certificates in respect of orchards found to be in a satisfactory condition. The Service of Fruit Growing, on which devolves the supervision of the harvesting, packing, embarkation, and certification of fruit intended for export, will authorize picking only in orchards certified by the Service of Plant Health Protection.

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW

OF

APPLIED MYCOLOGY

VOL. XV SEPTEMBER 1936

YAMAMOTO (W.) & ITO (T.). **On the brown cubical rot of Chamaecyparis obtusa S. et Z. f. formosana Hayata.**—*Ann. phytopath. Soc. Japan*, v, 4, pp. 293–307, 1 pl., 4 figs., 1936. [Japanese, with English summary.]

Chamaecyparis obtusa var. *formosana*, an occupant of the primeval forest of Formosa, is stated to be very liable to a brown rot of the heartwood caused by a fungus closely related to *Veluticeps fusca* Humph. & Long [apud Burt in his monograph of the Thelephoraceae, p. 329: *R.A.M.*, vi, p. 125], which greatly reduces the otherwise high commercial value of the timber.

Cross sections through the affected trunks show a variable number of light brown, irregularly spherical or oblong lesions, 2 to 35 by 1 to 20 cm., scattered through the heartwood. With age the colour of the patches deepens to chestnut and still later they disintegrate into friable, cuboid masses on desiccation through the shrinkage cracks extending either radially or following the annual rings. The resupinate, concentrically sulcate, dark brown or blackish, corky fruit bodies of the fungus, 1 to 12 by 0·7 to 7 cm., with free or slightly reflexed margins, develop both on the inside and outside of broken branches as well as on the wood of decorticated trunks. The flat hymenial surface is velutinous, turning from light to rusty brown and finally drab, and studded with protruding fascicles of brownish, irregularly branched, hyaline or coloured, often nodoso-septate hyphae, 3 to 5 μ in diameter. The basidia are elongated to clavate, 50 to 130 by 6·5 to 8·5 μ, with slender sterigmata, 6 to 10 μ long, and produce elliptical or elongated to elliptical, hyaline or rarely pale olivaceous basidiospores, unilaterally flattened and measuring 10 to 19 (mostly 11 to 13) by 3·5 to 5 μ.

Good growth was secured on Czapek's and various natural agars, including onion, prune, potato dextrose, malt, and soy-bean, the minimum, optimum, and maximum temperatures for mycelial development being below 10°, about 22°, and near 31° C., respectively.

HUTCHINSON (W. G.). **A method for staining rust mycelium in woody tissues.**—*Phytopathology*, xxvi, 3, pp. 293–294, 1936.

The writer describes a modification of the orseillin BB-aniline-blue-staining procedure described by Strasburger adapted for the microscopic

diagnosis of white pine blister rust [*Cronartium ribicola*]. Sections are transferred from water to a saturated solution of orseillin BB in 3 per cent. acetic acid for 10 to 12 hours, rinsed in 40 per cent. ethyl alcohol, stained with saturated aniline blue solution in 3 per cent. acetic acid for 15 to 30 minutes, rinsed in 40 per cent. ethyl alcohol, transferred successively to 95 per cent. alcohol for 2 to 5 minutes, absolute alcohol, clove oil, and then mounted in balsam. In properly differentiated tissues the mycelium stains violet to blue, lignified or suberized tissue red, parenchyma cell walls blue, nuclei and cytoplasm red, and haustoria deep red.

BAVENDAMM (W.). **Aus der Praxis der mykologischen Holzschutzmittelprüfung. I. Mitteilung.** [On the practical aspect of the mycological testing of timber preservatives. Note I.].—*Angew. Bot.*, xviii, 2, pp. 132–141, 3 figs., 1936.

Using the officially recognized wood block method for the toximetric determination of timber preservatives [*R.A.M.*, xv, p. 333], the writer tested the efficacy against *Merulius lacrymans*, *Coniophora cerebella* [*C. puteana*], and *Polyporus vaporarius* [*Poria vaporaria*] on a substratum of fir pulp saturated with 8 per cent. malt extract solution of basilite U [ibid., xiii, p. 667] (I.G. Farbenindustrie A.G., Uerdingen-am-Rhein), fluralsil-extra (Brand Dyeworks, Erbisdorf, Saxony) [ibid., xiv, p. 542], and an unspecified preparation not yet on the market. The two first-named proved equally toxic at a concentration of 0·1 to 0·2 per cent., while further technical improvements are necessary to place the last on the same level in respect of fungicidal activity, though it was conspicuously superior to the others in resistance to lixiviation. The outcome of the tests by this method confirmed previous observations as to the discrepancy of the fungicidal values obtained on the natural substratum and on agar [ibid., vii, p. 690; xi, p. 84].

WINNIG (K.). **Der übliche Fäulnisschutz bei Tannen- und Fichtenmasten und das neue Osmoseverfahren.** [The ordinary method of protection against decay in Fir and Spruce poles and the new osmotic process.]—*Elektrotech. Z.*, lvi, 31, pp. 857–858, 2 figs., 1 graph, 1935.

Full details are given of the mode of application of the osmotic process of timber preservation [*R.A.M.*, xv, p. 414], which may be carried out on fir and spruce as well as on the more rapidly reacting pine either with osmolit U (85 per cent. sodium fluoride, 10 per cent. dinitrophenolaniline, and 5 per cent. of a colloidal paste) or with osmolit U Arsen, consisting of 27·5 per cent. sodium fluoride, 37·5 per cent. potassium bichromate, 25 per cent. sodium arsenate, 10 per cent. dinitrophenol, with an added 5 per cent. of the colloidal paste. (This mixture, except for the last-mentioned ingredient, is known as thanalith U and basilite UA). One of the great advantages of the osmotic treatment is its simplicity, no technical skill or complicated apparatus being required as in the case of the ordinary methods of impregnation. A period of about three to four months is requisite for the complete absorption of the compound by the wood.

Nowak (A.). **Fortschritte auf dem Gebiete der Holzveredlung.** [Progress in the field of wood improvement.]—*Mitt. tech. VersAmt., Wien*, xxiv, pp. 63–65, 1935. [Received April, 1936.]

Some recent improvements in the treatment of wood for structural purposes are briefly reported, including the use as preservatives of thanalith U, osmolit U, and other relatively insoluble salts [see preceding abstract]. In Austria very satisfactory results are stated to have been obtained by pressure treatment with artificial resins, which fill the pores of the wood and thus prevent its penetration by water, besides acting as protectives against fungi.

Dunlap (A. A.). **Seedling culture in sand to prevent damping-off.**—*Phytopathology*, xxvi, 3, pp. 278–284, 1 fig., 1936.

Satisfactory development, combined with a noteworthy reduction in the incidence of the *Rhizoctonia* and *Pythium* types of damping-off [*R.A.M.*, xv, p. 484], was obtained in experiments at the Connecticut Agricultural Experiment Station with a number of seedlings, including beet, cabbage and other crucifers, celery, lettuce, pepper [*Capsicum annuum*], spinach, carrot, eggplant, cucurbits, beans [*Phaseolus vulgaris*], peas, parsley, tobacco, tomato, conifers, and various ornamentals in pure brown sea sand with the addition of a mineral nutrient solution, the type of which is relatively unimportant provided adequate amounts of nitrogen and potassium are present.

Walker (J. C.). **Resistance to club root in Brassica.**—Abs. in *Phytopathology*, xxvi, 2, p. 112, 1936.

In greenhouse trials with Wisconsin soil naturally infested by *Plasmodiophora brassicae* [*R.A.M.*, xiv, p. 807], only 3 out of 2,600 cabbage plants of 25 varieties remained healthy and Shogoin turnips consistently showed 100 per cent. infection. On the other hand, Snowball, Purple Top Milan, and White Milan turnips remained free from the disease throughout and rutabaga varieties were generally resistant. In white and black mustard samples from America and Europe the incidence of club root ranged from 16 to to 90 per cent. In a cross between the resistant Snowball and the susceptible Shogoin turnip the F_1 hybrids numbered 441 resistant to 22 susceptible.

Harter (L. L.). **Mosaic of Lima Beans.**—Abs. in *Phytopathology*, xxvi, 2, p. 94, 1936.

During the summer of 1935 from 5 to 10 per cent. of the plants in a Lima bean [*Phaseolus lunatus*] field in Maryland were found to be showing typical mosaic symptoms [*R.A.M.*, xi, p. 417; xv, p. 386] resembling in some respects those affecting garden beans [*P. vulgaris*: ibid., xv, p. 418] and including stunting and a noticeable reduction of yield. Up to 100 per cent. infection was obtained in inoculation tests on Lima beans with the expressed juice from diseased plants, the incubation period lasting six to seven days. The Stringless Green Refugee variety of *P. vulgaris* reacted negatively to inoculation with diseased *P. lunatus* juice, indicating that the disease is distinct from bean mosaic. Attempts to transmit the disease to broad beans (*Vicia faba*) were also unsuccessful, denoting that the mosaic of *P. lunatus* probably differs

from that of several common legumes, such as red and white clovers [*Trifolium pratense* and *T. repens*] and white sweet clover [*Melilotus alba*: loc. cit.]. Inoculations on cucumber and tobacco resulted in symptoms similar to those of cucumber mosaic [ibid., xv, p. 195].

KENDRICK (J. B.) & SNYDER (W. C.). **A vascular Fusarium disease of Radish.**—Abs. in *Phytopathology*, xxvi, 2, p. 98, 1936.

White Chinese winter radishes in California were observed in 1934 to be affected by a disease resembling cabbage yellows (*Fusarium conglutinans*). The symptoms included yellowing and shedding of the leaves (often unilateral), vascular discoloration, and severe stunting, and often terminated in death. The diseased vascular tissue yielded a *Fusarium* which caused over 90 per cent. infection in inoculation tests on white Chinese winter and Icicle radishes but was innocuous to early Jersey Wakefield cabbage and Jersey kale in the same soil. The fungus was ascertained to be a member of the *Elegans* section, producing an abundance of microconidia and terminal and intercalary chlamydospores; it is distinguishable from *F. conglutinans*, on the basis of Wollenweber's monograph on *Fusarium* [*R.A.M.*, xv, p. 321], by the deep purplish pigmentation of the cultures and occasional formation of dark sclerotia.

QUANJER (H. M.) & ROLAND (G.). **De vergelingsziekte en de mosaiekziekte van de Suiker- en Voederbiet. I. Geschiedenis van het onderzoek over de vergelingsziekte en de mosaiekziekte van de Biet. II. Onderzoek van de vergelingsziekte van de Biet, met enkele opmerkingen over de mosaiekziekte.** [The yellowing and mosaic diseases of Sugar and Fodder Beet. I. History of the investigation on the yellowing and mosaic diseases of Beet. II. Investigation on the yellowing disease of Beet, with some observations on the mosaic disease.]—*Tijdschr. PlZiekt.*, xlii, 3, pp. 45–70, 5 pl., 1936. [English summaries.]

In part I of this joint paper H. M. Quanjer traces and supplements by explanatory observations the history of virus yellows (syn. 'jaunisse', 'vergelingsziekte') of beet [*R.A.M.*, xv, p. 417 and next abstract] from 1898, when an apparently analogous condition was described by Prilleux and Delacroix, to the present day, a similar outline being given of the investigations on mosaic since 1915, when it was first reported by Lind from Denmark (*Tidsskr. Planteavl*, xxii, p. 444).

Part II, by G. Roland, is a condensed version of the paper abstracted below from another source.

[A French translation of Quanjer's paper and a reprint of Roland's full account of his investigations [see next abstract] also appear (with Flemish, German, and English summaries) as *Publ. Inst. belge Better.*, iv, 2, pp. 23–60, 5 figs., 1 diag., 1 graph, 1936.]

ROLAND (G.). **Recherches sur la jaunisse de la Betterave et quelques observations sur la mosaïque de cette plante.** [Studies on Beet yellowing and some observations on mosaic of this plant.]—*Sucr. belge*, lv, 11, pp. 213–217; 12, pp. 231–241; 13, pp. 263–268; 14, pp. 289–293, 5 figs., 1 diag., 1 graph, 1936.

A comprehensive account is given of the writer's studies at Wagen-

ingen, Holland, and in Belgium on virus yellows (yellowing) of beet [see preceding abstract], the principal features of which, as already described by Quanjer [*R.A.M.*, xiv, p. 209], are a yellow discoloration of the outer foliage, the accumulation of starch in the leaves, and gummosis of the phloem. The development of these symptoms is favoured by strong light and dry conditions. The disease was found to be transmissible by grafting and by the aphids *Myzus persicae* (in 41 out of 43 test plants) and *Aphis fabae* (22 out of 29), but not by *Chlorita flavescens* or *Lygus pratensis*. The infective principle overwinters in the roots of seed-bearers and wild beets. Analyses of healthy and diseased plants in a field at Noville, Belgium, showed significant reductions in the average weight of the leaves and roots of the latter (from 800 to 464 and from 990 to 430 gm., respectively), as well as in the sugar content of the roots (from 14·25 to 13·10 per cent., or expressed in weight, from 141 to 56 gm.). Secondary infection by *Sporodesmium putrefaciens* [ibid., xiii, p. 210] and *Uromyces betae* [see above, p. 481] was readily obtained on yellowed leaves, whereas the former was incapable of attacking healthy foliage and the latter did so only with difficulty. The control of virus yellows presents great difficulties both as regards the extermination of the insect vectors and the selection of healthy seed-bearers, in which the symptoms are frequently masked during the first year of infection. One of the first steps to be taken in combating the disease is a systematic search for alternate hosts ensuring the perpetuation of the virus from one year to the next.

The symptoms induced by beet mosaic [ibid., xv, p. 193] are of such divergent aspect that they cannot always be appropriately designated by a single term. Their development appears to be considerably retarded by powerful illumination, the normal incubation period of 11 days being extended to 22 in a test involving four hours' exposure to a neon lamp. *M. persicae*, as shown by Robbins in the United States [ibid., i, p. 230], is capable of transmitting mosaic from diseased to healthy beets.

SCHUSTER (L.). **Ein gefährlicher Zuckerrübenschadling.** [A formidable Sugar Beet pest.]—*Naturforscher*, xii, 12, pp. 415–416, 1936.

It is believed that the beet leaf bug (*Piesma quadrata*) [*Zosmenus quadratus*], the vector of crinkle [*R.A.M.*, xv, p. 477], is largely instrumental in the loss of some 1½ million zentner [nearly 74,000 tons] of sugar, corresponding to M.25,000,000, from the German harvest of 1935 which was lower by 4 per cent. than that of the previous year notwithstanding an extension of the area under sugar beets by 5 per cent. The disease, which may affect 70 or 80 per cent. of the plants in a stand or destroy the crop completely, was first reported 21 years ago from Glogau, Silesia, since when it has spread to Brandenburg, Saxony, and Anhalt, and has further been observed sporadically of recent years in Württemberg, Hesse, and Hanover. Control measures are briefly indicated.

Die Entseuchung der Zuckerrübensaat. [Sugar Beet seed disinfection.] —*Zbl. Zuckerindustr.*, xliv, 15, pp. 324–325, 1 diag., 1936.

This is an abstract of a paper by Van Scherpenberg in *Z. niederl. Zuckerfabr.*, 31st December, 1935, giving an account of the construction

and operation of Verhoeven's apparatus [*R.A.M.*, vi, p. 648] for sugar beet seed-cluster disinfection with copper sulphate against root rot (*Phoma betae, Pythium de Baryanum*, and *Aphanomyces levis*) [ibid., xv, p. 337, 486], which is stated to be practised on a large scale at the sugar factories of Dinteloord and Sas van Gent. The apparatus in question can treat 6,000 kg. of seed in 24 hours, and the following points may be noted. In a laboratory test on the comparative germinative capacity of treated and untreated seed, the latter was found to exceed the former by 20 per cent. after five days. The seed is treated for three hours in copper sulphate solution at 43° C., and after drying in the hot air drying-cylinder (Büttner and Meyer) to a moisture content between 20 and 30 per cent., is subsequently spread out in a layer up to 50 cm. in height on a warmed sheet of iron until the drying process is completed, when the moisture content should not exceed 10 per cent.

TOMPKINS (C. M.), RICHARDS (B. L.), TUCKER (C. M.), & GARDNER (W. M.). **Phytophthora rot of Sugar Beet.**—*J. agric. Res.*, lii, 3, pp. 205–216, 1 pl., 3 figs., 1936.

A brief account is given of a severe tap-root rot of sugar beet, which was first observed in 1927 in the Cache Valley of northern Utah, doing considerable damage to the crop, and has since also been found in Idaho, Colorado, and California on poorly drained or waterlogged soils, where it greatly reduced the size and sugar content of the beetroots. In the early stages of the disease, the affected plants may wilt temporarily during daytime, but later the wilting is permanent and the plant is eventually killed. Infection usually occurs at the basal end of the tap-root, and invasion progresses gradually upward. Under field conditions the affected parenchyma of the root may soften and disintegrate, only leaving the vascular bundles. Lesions may also arise on the sides and occasionally near the top of the tap-root; infrequently the lateral roots and rootlets may become infected first. Externally the lesions are predominantly mummy-brown to light seal-brown, darker brown towards the centre; internally the diseased tissue is sharply delimited from the healthy, and light to blackish brown in colour. Isolations from diseased material constantly and readily yielded *Phytophthora drechsleri* [*R.A.M.*, x, p. 755], which grew in culture at temperatures ranging from 8° to 35° C., with an optimum between 28° and 31°, as well as throughout a wide range of P_H values. It was experimentally shown readily to attack both wounded and unwounded beetroots in the field, and to cause a damping-off of the sugar beet seedlings at temperatures of 25° to 31° but not in the field. The fungus was pathogenic through wounds to the roots of garden beet, carrot, turnip, and parsnip, and also to potato tubers, apples, summer squash [*Cucurbita pepo*], green pepper [*Capsicum annuum*], and green tomato fruits. Unwounded summer squash, green pepper, and eggplant fruits were also attacked by the fungus.

NAGEL (C. M.). **The influence of Cercospora-infected soil in relation to the epidemiology of Cercospora leaf spot on Sugar Beets.**—Abs. in *Phytopathology*, xxvi, 2, p. 103, 1936.

Cercospora beticola, the agent of leaf spot of sugar beets [*R.A.M.*, xv,

p. 486], was cultured on five types of soil, namely, peat and four loams—basic black, acid black, neutral black, and black with little organic matter. The best mycelial growth was obtained on peat. After five weeks in a closed moist chamber at 24° to 26° C. the cultures were transferred to ordinary laboratory temperatures, under which conditions the organism was shown by nutrient agar transfers to remain viable for 2¼ years. The typical symptoms of the disease developed in seedlings directly inoculated with soil cultures of *C. beticola*, while plants grown in the greenhouse on naturally infested soil showed spotting both of the cotyledonary and true leaves. A technique was developed for isolating the fungus from the soil by means of the host plant.

Borax som Middel mod Plantesygdomme. [Borax as a remedy for plant diseases.]—*Medd. Forsøgsv. Plantek. Kbh.* 249, 3 pl. 3 figs., 1936.

Brown heart of swedes, heart and dry rot of beets [*R.A.M.*, xv, p. 416, 476], and heart and dry rot of celeriac are all stated to be controllable in Denmark by the application of borax to the soil, using 15 kg. per hect. for the two first-named and 15 to 30 kg. for the last.

Stubbs (M. W.). **Viroses of the garden Pea, Pisum sativum.**—Abs. in *Phytopathology*, xxvi, 2, pp. 108–109, 1936.

Pea mosaic has been shown to be due to more than one virus. Enation mosaic (pea virus 1) [*R.A.M.*, xv, pp. 274, 418] infected soy-beans and all pea varieties used in the writer's field and greenhouse studies, causing dwarfing, foliar spotting and enations, and pod distortion [ibid., xiii, p. 415]. It was transmissible by pea aphids [*Macrosiphum pisi*] and plant extract and was inactivated by four days' ageing *in vitro* and 1 in 3,000 dilution. White lupins and several pea varieties (excluding Perfection) were infected by marble pea mosaic (virus 2 A), speckle pea mosaic (virus 2 B), and mild pea mosaic (virus 2 C), the first-named causing mottling, extensive foliar chlorosis, dwarfing, leaf-drop, and stem discoloration, the second speckled mottle, slight chlorosis, and other inconspicuous symptoms, and the third only a very faint mottling. These three viruses were also transmitted by aphids and plant extract (with abrasive) and were inactivated by one day's ageing and 1 in 1,500 dilution. All the viruses tested infected crimson clover [*Trifolium incarnatum*], broad beans [*Vicia faba*], sweet peas, and yellow sweet clover [*Melilotus officinalis*], but not red clover [*T. pratense*] or garden beans [*Phaseolus vulgaris*].

Horsfall (J. G.) & Arnold (E. L.). **The problem of drilling dusted seed: effect of graphite.**—*Bull. N.Y. St. agric. Exp. Sta.* 668, 23 pp., 5 graphs, 1936.

In the spring of 1935 the seeding rate of peas dusted with red copper oxide in New York [*R.A.M.*, xv, p. 282] was reduced by up to 30 per cent. owing to the obstruction of the drills induced by increased interfacial friction between the seeds, the surfaces of which were separated by the non-lubricating dust. The difficulty may be overcome by spraying the seed with water at the rate of about 5 tablespoonfuls per bush. at seeding time, the water not being allowed time for penetration into

the seed. A much better method is to incorporate 325-mesh graphite at the rate of $1\frac{1}{2}$ oz. per bush. at the time of treatment with the dust; this substance is completely inert and will not penetrate the seed, impair germination, or interfere with the protective action of the chemical. Good results have also been obtained by this means with red copper oxide-treated [ibid., xv, p. 484] spinach and wheat, copper carbonate-treated wheat, and semesan-treated cabbage.

STEVEN (W. F.). **Uromyces fabae de Bary. Occurrence of the aecidial stage on the leaves of Vicia faba L. in Britain.**—*J. Bot., Lond.*, lxxiv, 879, p. 79, 1936.

The author records the occurrence of aecidia of *Uromyces fabae* [*R.A.M.*, xv, p. 529] on a number of leaves (about 20) of young self-sown bean (*Vicia faba*) plants in a field near Cambridge in November, 1935.

BREMER (H.). **Zur Bekämpfung des Zwiebelbrandes.** [On the control of Onion smut.]—*Phytopath. Z.*, ix, 1, pp. 53–68, 4 figs., 1 diag., 1936.

Experiments were carried out at the Aschersleben [Saxony] branch of the Biological Institute to determine the value of American and German methods of combating onion smut (*Urocystis cepulae*) [*R.A.M.*, xv, p. 464], the control of which is stated to be absolutely essential for the continuance of onion cultivation in the affected fields. The somewhat laborious formalin drill process [ibid., ii, p. 460] has been partially superseded in the United States by the use of formalin dust [ibid., ix, p. 509] and other dry preparations, but none of these gave satisfactory results under local conditions. Excellent control of the disease and increased yields of up to 188 per cent. were secured, however, by treatment of the slightly moistened seed (15 c.c. water per 100 gm.) with half its weight of Präparat B (a commercial product of unknown composition).

NELSON (R.) & COCHRAN (L. C.). **Copper dusts control Celery early blight.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xviii, 3, pp. 163–169, 3 figs., 1936.

Attention is drawn to the urgent necessity of timely treatments for the control of early blight of celery (*Cercospora apii*) [*R.A.M.*, xiv, p. 563] in Michigan, where the disease has assumed a most destructive form in three out of the past four years. Equally good results were given in 1935 by eight applications, beginning on 21st June and ending on 6th August, of either copper-lime dust (25–75) or cuprocide at the rate of 50 lb. per acre (25 lb. for the second and third), the total cash return to the grower from eight dusted rows being at the rate of $400 per acre compared with $24 from six untreated, the cost of protection per acre being estimated at from $13 to $21. For the control of both early and late blight (*Septoria apii* and its var. *graveolentis*) [ibid., xiv, p. 343], 30 minutes' immersion of the seed in a 1 in 1,000 solution of corrosive sublimate is recommended, followed by four or five applications in the seed-bed of a copper-lime dust or Bordeaux mixture and in the field by treatment on the lines indicated above. The irrigation schedule should be so arranged as to keep the plants dry at night, and water should be applied only when the temperature is rising.

Richardson (J. K.). **Control of late blight of Celery.**—*Sci. Agric.*, xvi, 7, pp. 358–364, 2 figs., 1 graph, 1936.

A summary is given of five years' field experiments (up to 1935) which were carried out in the Niagara Peninsula on the control of late blight of celery (*Septoria apii-graveolentis*) [see preceding abstract] with various copper and sulphur containing sprays and dusts. The results showed that the best control was obtained by applications of 4–5–40 Burgundy or 4–4–40 Bordeaux mixtures or of 20–80 monohydrated copper sulphate-lime dust. The treatments should be started early in the season, before the celery seedlings are planted out in the field, and repeated, before rainy periods whenever possible, at sufficiently close intervals to keep the new growth covered with the fungicide.

Walker (M. N.). **A wilt-resistant Watermelon for Florida.**—*Bull. Fla agric. Exp. Sta.* 288, 13 pp., 8 figs., 1936.

In Florida watermelon wilt (*Fusarium* [*bulbigenum* var.] *niveum*) [see above, p. 486] is widespread, and large-scale growers use virgin land each year to avoid infection, though some smaller growers replant the same land after five to seven years. The continuous use of new land in this locality has almost depleted the supply, thousands of acres formerly planted with watermelons having being abandoned to scrub oak, and unless a marketable resistant variety is grown the industry must decline.

Resistance trials were begun at Leesburg in 1930, and while a number of selections showed promise which was not fulfilled in subsequent trials, one selection from the 1931 field crop tested in 1932 was of outstanding resistance and quality, and has maintained its superiority. Two types were isolated from this stock and sufficient seeds obtained from one of them in 1935 to plant several acres. This melon gave most promising results, the various selections showing resistance ranging from 75 per cent. upwards. It has been named the Leesburg melon and was developed from the Kleckley Sweet variety, many of whose characters it possesses.

Kalashnikoff (K. J.). Экологические обоснования защиты Огурцов от бактериоза в теплицах. [Control of Cucumber bacteriosis based on the ecological conditions in hothouses.]—*Pl. Prot. Leningr.*, *1935*, 3, pp. 55–59, 1935. [English summary. Received May, 1936.]

The results of the experiments briefly reported in this paper showed that angular leaf spot (*Bacterium lacrymans*) [*R.A.M.*, xv, p. 197] of cucumber in hothouses in the neighbourhood of Leningrad can be economically controlled by constantly maintaining the temperature between the limits of 25° and 34° C., care being taken not to allow moisture to collect in drops either on the leaves or on the fruit, which is also attacked by the organism. A lowering of the temperature below 25° is only permissible for very short periods, e.g., during intensive harvesting of the cucumbers in the hothouse. High temperatures do not affect adversely the health of the cucumber plant.

NISIKADO (Y.) & YAMAUTI (K.). **On the spore germination and the pure culture of Armillaria matsutake Imo et Imai, the most important edible Mushroom in Japan.**—*Ber. Ōhara Inst.*, vii, 2, pp. 273–288, 4 pl., 1936.

Germination of the basidiospores of *Armillaria matsutake*, the principal edible mushroom of Japan [*R.A.M.*, xv, p. 72], took place in the writers' experiments on pine forest soil decoction agar, with or without 2 per cent. glucose, and malt extract agar. The most favourable hydrogen-ion concentration for the process was found to lie between P_H 4 and 6, the optimum temperature between 24° C., with minima and maxima at 10° to 15° and 26° to 29°, respectively. The mycelium of the fungus made satisfactory but very slow growth on the above-mentioned soil decoction agar, Knop's agar, Sachs's agar with glucose, and Hopkins's agar, the minimum, optimum, and maximum temperatures for its development being 5°, 24°, and 30° to 32°, respectively. Clamp-connexions were observed in vegetations arising from more than two basidiospores.

UPPAL (B. N.), KAMAT (M. N.), & PATEL (M. K.). **A new variety of Oidiopsis taurica.**—*Indian J. agric. Sci.*, vi, 1, pp. 110–115, 1 pl., 1 graph, 1936.

In 1933 a fungus generally resembling *Oidiopsis taurica* [*R.A.M.*, xiv, pp. 83, 146, 561] was found causing a powdery mildew of one or two vines only of *Dolichos lablab* at Poona. The upper leaf surfaces bore dull red, irregular spots, delimited by the veins, and the under sides white patches of mildew of corresponding extent; defoliation of the affected plants ensued. The organism was found to differ from *O. taurica* in its much longer spores (47 to 111 compared with 32 to 82 μ) and is accordingly named [with an English diagnosis] *O. taurica* var. *macrospora*. A high degree of specialization on the part of *O. taurica* and the new variety was revealed by the results of cross-inoculation experiments with the former from *Cyamopsis psoraloides*, *Oxalis corniculata*, and *Euphorbia geniculata*, and with the latter from *D. lablab*, all the forms being strictly confined to their own hosts.

LAFFOND (P.). **Les principaux ennemis du vignoble algérien en 1935.** [The chief enemies of Algerian vineyards in 1935.]—*Progr. agric. vitic.*, cv, 3, pp. 63–67, 1936.

Brief notes are given on the development in 1935 of the more important diseases and pests of the vine in Algeria. Owing to warm and wet summer conditions in certain regions, downy mildew (*Plasmopara viticola*) is stated to have caused the loss of 20 to 30 per cent. of the crop in the more heavily infected vineyards. In the other regions the chief damage to the vine was done by *Oidium* (*Uncinula necator*); in the littoral zone, in particular, the grape crop was rescued from total loss only by spraying with a solution of 125 gm. potassium permanganate in 100 l. water, followed immediately after by dusting with sulphur. Cases of court-noué [*R.A.M.*, xv, p. 199] were found in the very sandy soils in the vicinity of Algiers, showing the presence in some of the infected material of a sparse and very fine mycelium, which may eventually prove to belong to *Pumilus medullae* [ibid., xiv, p. 675].

Biron (M.). **Excoriose et poudrages cupriques.** [Excoriosis and cupric dusts.]—*Rev. Vitic., Paris*, lxxxiv, 2168, pp. 42–45, 1936.

The author gives a brief popular account of excoriosis of the vine (*Phoma flaccida*) [*R.A.M.*, xiv, p. 675], and states that a measure of control of the disease may be obtained by avoiding over-moist soils for planting and by liberal application to the soil, especially after one or two heavy harvests, of phosphoric acid and potash fertilizers to induce early lignification of the new shoots. He also recommends at least one application to the vinestocks after pruning of a spray containing alkaline naphtho-arsenites or paraffin oil, or swabbing the stocks with 10 per cent. sulphuric acid or with a 1 or 2 per cent. solution plus 30 per cent. iron sulphate. The best control, however, is given by dusting the vines during vegetation with finely divided and adherent cupric dusts, special care being taken to apply the dust to the bases of the new shoots that develop during the season.

Beaumont (A.) & Staniland (L. N.). **Twelfth Annual Report of the Department of Plant Pathology, Seale-Hayne Agricultural College, Newton Abbot, Devon, for the year ending September 30th, 1935.**—32 pp., 1936.

In this report, which is on the same lines as those for previous years [cf. *R.A.M.*, xiv, p. 676], it is stated that in 1935 approximately similar results were obtained in forecasting outbreaks of potato blight [*Phytophthora infestans*: *R.A.M.*, xv, p. 522] by applying the two days' high humidity rule as by determinations based on other favourable factors (dew, minimum temperature of 50° F., under 5 hours' sunshine, at least 0·01 in. rainfall, relative humidity not under 75 per cent. at 3 p.m.). The evidence showed that infection follows a period of high humidity only if the temperature is high enough, temperature being one of the most important limiting factors governing blight outbreaks.

Of five antirrhinum varieties grown at Seale-Hayne two showed about 70 per cent. rust [*Puccinia antirrhini*: ibid., xv, p. 442, and below, p. 559], while the resistant varieties had only 5 to 30 per cent. infection; the development of resistant varieties would therefore appear to be a promising method of control.

In notes on a large number of fungi capable of rotting apples and pears it is stated that bitter rot (*Gloeosporium fructigenum*) [*Glomerella cingulata*: ibid., xiv, pp. 40, 596] occurs very frequently, but not often abundantly. A very similar and equally common form is caused by *G. album* [ibid., vi, p. 527] with pale spore masses, but microscopic examination is necessary for identification. Eye rot (*Nectria galligena*) [ibid., xiii, p. 584] is very common on pears but rare on apples in Devon and Cornwall. *Phytophthora cactorum* [ibid., xiv, p. 371] is very frequent in the early autumn on apples and pears both on the tree and in storage. Storage rots included *Rhizopus nigricans* [ibid., xiii, p. 523] on pears and *Diaporthe perniciosa* [ibid., xiv, p. 771] on apples.

Small (T.). **Report of the Mycologist.**—*Rapp. aux États de Jersey, 1935*, pp. 27–43, 1936.

This report contains, among others, the following items of phyto-

pathological interest. Potato blight (*Phytophthora infestans*) [*R.A.M.*, xiv, p. 492; xv, p. 45] appeared in many fields in Jersey early in June, 1935, and owing to the neglect of control measures became widespread and severe in certain areas. In future the inspection of the potato crop should be begun earlier in order that all the growers may be visited and no unfit produce exported; many fields would have been saved by prompt inspection and the postponement of digging. Scorching the haulms with oil of vitriol (sp.g. 1·70) gave far better control than the same practice using copper sulphate. Cutting the haulms is a cheap and reliable control method, but should not be resorted to when the disease is actively present on them. Infection was present on numerous volunteer potatoes outdoors in January and February, and was first reported on the new outdoor crop on 24th April.

Pink rot (*P. erythroseptica*) [ibid., xiv, p. 180] was noted for the first time in Jersey in 1935. *Sclerotinia sclerotiorum* was prevalent on potatoes and also occurred on tomatoes in the autumn, infection probably being favoured by a wet season.

Bruce turnips and Wilhelmsburger swedes were resistant to *Plasmodiophora brassicae* [ibid., xiv, p. 493 and above, p. 547].

SAREJANNI (J. A.). **Liste 1 des maladies des plantes cultivées et autres de la Grèce.** [List 1 of diseases of cultivated and other plants of Greece.]—*Ann. Inst. phytopath. Benaki, Greece*, i, 2, pp. 13–20, 1935. [Received July, 1936.]

A list is given of some well-known fungal and bacterial diseases affecting cereal, fruit, vegetable, and miscellaneous crops, trees, vines, ornamentals, and weeds in Greece [see next abstract]. The material on which the records are based was examined at the Benaki Phytopathological Institute from 1931 to 1933.

SAREJANNI (J. A.). **Notes phytopathologiques.** [Phytopathological notes.]—*Ann. Inst. phytopath. Benaki, Greece*, i, 3, pp. 67–76, 1 fig., 1935. [Received July, 1936.]

In June, 1934, over half the tomato plants growing in fields near Lake Janina, Greece, were severely affected by a form of leaf roll, in which the leaves on the lower branches showed a pale green under surface, and were thickened, in some cases deformed, and invariably stiff and very brittle. The affected branches rapidly dry up as the disease spreads up the plant, killing the leaves and branches as it goes. By July the plants are completely withered, practically none of the fruits having matured. The disease appears every year at Janina towards the end of May and has also been observed near Athens; the cause has not yet been ascertained.

Leaves of *Pistacia vera* from various parts of Greece and the neighbouring islands frequently bore the pycnidia of *Septoria pistacina* Allescher [*R.A.M.*, viii, p. 339], some of the stylospores reaching 70 μ in length. The author suggests that Allescher's creation of a separate species because the stylospores of *S. pistaciae* measured only 20 μ in length (as against 50 μ for *S. pistacina*) may not be well founded, the different measurements simply indicating pycnospores of the same

species but at different stages of maturity. Infections occur annually in spring and autumn. The former sometimes causes heavy losses unless Bordeaux mixture is applied as a preventive measure.

A grey rot of vine floral buds, which coincided with the onset of damp, cold weather and became arrested when the weather improved, was invariably associated with *Botrytis cinerea*; the condition was frequently accompanied by a leaf rot apparently identical with the leaf scorch described by Ravaz [ibid., vi, p. 595] in association with grey rot.

During February and March almond leaves in Crete show the orange spots produced by *Polystigma ochraceum* [ibid., xiv, p. 429]; no damage is caused either here or in Attica, but very heavy losses are caused by the same fungus in Chios, where the cultural conditions are unsatisfactory. In 1933, apricot leaves at Kiphissia were covered with the perithecia of *Podosphaera* [*oxyacanthae* var.] *tridactyla* [ibid., v, p. 699]. The perithecia of *Uncinula necator* were found on vine leaves, probably their first record in Greece.

Saintpaulia ionantha plants were infected by a *Phytophthora* resembling *P. cactorum*. *Spartium junceum* at Kiphissia is gradually disappearing as a result of infection by a *Microsphaera* resembling *M. bäumleri* and *Trichocladia bäumleri* which destroys the young branches, floral buds, and young leaves.

MITRA (M.). **Report of the Imperial Mycologist.**—*Sci. Rep. agric. Res. Inst. Pusa, 1933–34*, pp. 139–167, 1936.

The P. 113, P. 114, P. 111, and Punjab 8A wheat varieties grown at Karnal showed, respectively, 0·49, 0, 0·49, and 24·2 per cent. infection by *Ustilago tritici*; Pusa 114 was unaffected, and appeared to be highly resistant. In 1931–2 orange rust (*Puccinia triticina*), yellow rust (*P. glumarum*), and black rust (*P. graminis*) appeared on wheat at Pusa on 26th December, 16th January, and 5th February, respectively, the corresponding dates for 1932–3 being 29th December, 3rd February, and 13th February, and for 1933–4 being 20th December, 19th January, and 7th February. Barley seed treated with ceresan and uspulun in a small-scale test gave plants free from *U. hordei*, plots from seed treated with formalin and from untreated seed showing 0·5 and 6 per cent. infection, respectively.

An apparently new species of *Cercospora* forming spots on the stem and pod of sann-hemp [*Crotalaria juncea*] was common at Pusa and its pathogenicity proved. A detailed study of a *Cercospora* parasitic on the leaf, stem, and pod of *Glycine hispida* showed that it did not agree with *C. daizu* [ibid., xiii, p. 490]. All the locally grown varieties were susceptible. The disease appears to be seed-borne.

Infection of gram [*Cicer arietinum*] by a *Mystrosporium* [ibid., xi, p. 425] was very severe on Type 68 and moderately so on Types 48, 49, and 67; on 18 types the attack was slight, and on 34 only a trace of blight was present.

'Phurki' disease of cardamom [*Amomum subulatum*] has rendered the cultivation of this crop almost impossible in the Darjeeling district. In some of the affected roots a *Cephalosporium* of as yet unknown significance was present.

A vine leaf spot due to a fungus resembling a *Guignardia* was very common at Pusa.

Cercospora tageticola was noted for the first time infecting the leaf stems and inflorescences of *Tagetes patula*. The disease, which was epidemic, was carried from diseased to healthy flowers by bees. Other new records included *Phytophthora parasitica* var. *nicotianae* on tobacco stems and roots and *Ceratostomella paradoxa* (in culture from the conidial stage) and *Sclerotium rolfsii* on sugar-cane [ibid., xiv, p. 470; xv, p. 465].

In the second part of this report (by S. V. Desai) it is stated that sugar-cane mosaic was transmitted to sorghum, *Euchlaena mexicana*, and maize by infecting them with the juice of sugar-cane mosaic leaves, but the reverse transmission to sugar-cane was not found possible [ibid., ix, p. 724; cf. also xv, p. 528]. At Pusa virulence, which varies with the climatic conditions, is sufficient for artificial transmission from 15th March to 15th June only.

McDonald (J.). **Annual Report of the Senior Mycologist.**—*Rep. Dep. Agric. Kenya, 1934*, ii, pp. 24–39, 1936.

In addition to the work already noticed from Part I of this report [*R.A.M.*, xv, p. 482] the following items are of interest. There were indications that a different physiologic form of wheat yellow rust (*Puccinia glumarum*) was present in Kenya in 1934 from that found in 1933 [ibid., xiv, p. 427]. Leaf spot (*Septoria tritici*) [ibid., xi, p. 745] was recorded at Molo for the first time in Kenya. From a minor but fairly common disease of maize seed taking the form of a dark brown discoloration (sometimes appearing as striations) near the germ end, just outside the portion inserted into the scaly tissues of the core, and apparently confined to the seed coat, a *Penicillium* allied to *P. pinophilum* [ibid., xi, p. 717] was isolated. Ear rot of maize (*Diplodia zeae*), previously uncommon and unimportant in Kenya, was rather prevalent [ibid., xi, p. 159].

In a test for the control of barley covered smut (*Ustilago hordei*) seed-dusting with agrosan G and abavit B gave 0·21 and 0·65 per cent. smutted heads, respectively, as compared with 2·18 per cent. in the untreated plot [ibid., xiii, pp. 570, 625]. Sorghum grown from seed treated with granosan [ibid., xiv, p. 809] averaged 1·2 per cent. smut (*Sphacelotheca sorghi*) [ibid., xiii, p. 648; xiv, p. 574] as against 55·6 per cent. for the untreated, the yield of clean grain being at the rate of 2,786 lb. and 1,624 lb. per acre, respectively.

Linseed stem-break (*Polyspora lini*) [ibid., xv, p. 441], not recorded in Kenya for some years, occurred in a severe form on the Bison variety at Njoro, 43 per cent. of the plants being affected; among other varieties Bullmoose showed 4 per cent. and Persian Gulf about 0·25 per cent. infection, while Redwing, Rio, Ottawa 770 B, Morocco, and La Plata were unaffected.

New records made included *Gibberella fujikuroi* var. *subglutinans* [ibid., xv, p. 359] and *Colletotrichum graminicolum* on maize [ibid., xv, p. 494], *Helminthosporium gramineum* on barley [ibid., xiv, p. 433; xv, p. 48], and *Ascochyta pisi* on *Vicia faba* [ibid., xiii, p. 670]. The following wood-rotting fungi were also recorded: *Stereum bicolor*, *S. cinerascens*, and *Sarcoxylon aurantiacum*.

Russell (T. A.). **Plant pathological Report, 1935.**—*Rep. Bd Agric. Bermuda, 1935*, pp. 18–23, 1936.

This report [cf. *R.A.M.*, xiv, p. 559] contains the following items of phytopathological interest, apart from those already noticed from other sources. Carrots with the tops and outside leaves rotted by *Sclerotinia sclerotiorum* [ibid., xiii, p. 356] showed no infection of the roots when dug, but after a few days the fungus spread to them either through the crown or from rotted leaves in contact with them. Celery stored at 36° F. rapidly rotted away as a result of infection by *S. sclerotiorum*; care must be taken before placing celery in cool storage to see that it is free from the fungus.

The chief diseases of Easter lilies [*Lilium longiflorum* var. *eximium*] were rosette or 'yellow flat' [ibid., xiii, p. 165; xiv, p. 153] and stump rot (*Phytophthora parasitica*) [ibid., x, p. 667]. The fruiting of lime trees [*Citrus medica*] was impaired as a result of infection by *Gloeosporium limetticolum* [ibid., xiv, p. 84]. Antirrhinums showed a leaf-blight and die-back associated with *Phyllosticta antirrhini* [ibid., xi, p. 745] and in many gardens were affected by rust (*Puccinia antirrhini*) [see above, p. 555]. Crown rot of *Gerbera* plants was caused by *S. sclerotiorum*. Roses were widely affected, some varieties severely, by *Diplocarpon rosae* [ibid., xiv, p. 313].

Forty-eighth Annual Report of the Colorado Agricultural Experiment Station for the fiscal year 1934–1935.—36 pp., 1935. [Received June, 1936.]

The following items of phytopathological interest occur in this report. In an attempt to arrest the spread of peach mosaic [*R.A.M.*, xiv, p. 222], 20,000 trees have been eradicated. Budding and grafting experiments demonstrated the virus origin of the disease and its spread from tree to tree by these operations.

Satisfactory progress has been made in the development of a tipburn-resistant variety of head lettuce [ibid., xiii, pp. 496, 560]. Bacterial wilt of lucerne [*Aplanobacter insidiosum*: ibid., xiv, p. 682] is stated to be widespread on the Eastern Slope. Affected stands do not usually live more than three years, but during the last five years Hardistan, a strain of Turkestan lucerne, has persisted two years longer in field tests than Baltic, Grimm, or Common [ibid., xiv, p. 222]. Its yield, however, was some one-fifth less during the first three years than that of the superior Baltic and Grimm strains.

Lyon (H. L.). **Botany, forestry and pathology.**—*Rep. Hawaii. Sug. Exp. Sta. 1935* (*ex Proc. Hawaii. Sug. Pl. Ass., 1935*), pp. 26–37, 1936.

This report [cf. *R.A.M.*, xiv, p. 530] contains the following items of phytopathological interest. C. W. Carpenter states that powdery scab (*Spongospora subterranea*) [ibid., xv, p. 393] of Irish potatoes was identified apparently for the first time in Hawaii, where it is thought to be even less important than common scab (*Actinomyces scabies*). Dry rot (*Diaporthe batatatis*) [*D. phaseolorum* var. *batatatis*: ibid., xv, p. 277] was found on Tahitian sweet potatoes at Manoa.

J. P. Martin observed leaf scald [*Bacterium albilineans*: ibid., xv, p. 346] for the first time at Waiakea on the stalks of Yellow Caledonia sugar-cane weakened by lightning injury. In regions where the disease is of major importance the most effective control of leaf scald is obtained by planting resistant varieties. The disease may appear to be insignificant, or may even remain unrecognized for a long time when the symptoms have disappeared, while tolerant varieties may possibly carry infection indefinitely. The variety 29–3859 outyielded crop cane in tests on several plantations along the Hilo Coast in spite of scattered stools affected with leaf scald.

When H 109 sugar-cane plants were grown (by J. P. Martin) in nutrient solutions (i) lacking, (ii) containing an excess, of one of the following elements: nitrogen, potassium, phosphorus, calcium, magnesium, sulphur, or manganese and were sprayed with sporés of the eye-spot fungus [*Helminthosporium ocellum*: see below, p. 606] varying degrees of infection resulted, the least in the minus nitrogen and minus calcium series.

Experiments in co-operation with R. J. Borden showed a definite response of Sudan grass (*Andropogon sorghum* var. *sudanensis*) [*Sorghum sudanense*] grown in Hamakua soil to calcium applications. It is believed that both phosphorus and calcium function partly by increasing the resistance of the roots to *Pythium* [*graminicolum*: ibid., xv, p. 465]. The addition of pure cultures of the fungus to Sudan grass and sugar-cane growing normally in pots with only moderate applications of superphosphate, nitrogen, and potash resulted in depressed growth.

Hurtado (E. A.). **A survey of the plant diseases in Maridagao, Pikit, Cotabato, with some suggestions for their control.**—*Philipp. J. Agric.*, vii, 1, pp. 121–127, 6 pl., 1936.

Semi-popular notes are given on some cacao, coffee, rubber, and citrus diseases, including die-back (*Gloeosporium* sp.) and black rot (*Fusarium* sp.) of the first-named [*R.A.M.*, xiv, p. 567], observed at the Maridagao (Philippines) Rubber Experiment Station in 1934, with general recommendations for their control.

Levine (M.). **Studies on Bacterium tumefaciens in culture media.**—*Amer. J. Bot.*, xxiii, 3, pp. 191–198, 3 figs., 1936.

Daily smears from a culture of *Bacterium tumefaciens* (hop strain) showed that the organism undergoes morphological changes, probably induced by the diminution of the nutritive content of the media combined with an increase in the katabolic products of the bacterium [*R.A.M.*, v, p. 216; xi, p. 357]. Such changes are not true mutations, since they do not perpetuate themselves, but rather represent phases in the life-cycle of the organism. The organisms from old cultures consistently assume on transference to fresh media the rod forms typifying the 'embryonic' stage of the species. Variations in the virulence of individual cultures of the organism were observed.

Bact. tumefaciens appears capable of resisting adverse conditions, such as intensive desiccation and exposure to light. In the early stages of development it can survive temperatures of about 50° C., and the thermal death point for older cultures may be even higher. The spore-

like bodies constantly observed in old cultures appear to represent a morphological adaptation of the organism to the unfavourable influences of desiccation, light, and possibly heat. This facility of adjustment to the environment may explain the capacity of *Bact. tumefaciens* and other bacterial plant pathogens to overwinter and exist in the soil for periods of over a year [ibid., xiii, p. 786]. Microscopic studies of Siegler's apple woolly knot organism [ibid., viii, p. 249; cf. also x, pp. 166 et seq.] showed its cultural characters to be quite distinct from those of *Bact. tumefaciens*, while in laboratory tests it produced only small excrescences on rose, geranium [*Pelargonium*], rubber, willow, *Bryophyllum*, apple, and other plants.

SMITH (C. O.). **Crown gall on Araucaria bidwillii.**—*Phytopathology*, xxvi, 4, pp. 400–401, 1 fig., 1936.

Pseudomonas [*Bacterium*] *tumefaciens*, isolated from peach, is stated to have been successfully inoculated into *Araucaria bidwillii* in California [cf. *R.A.M.*, xiv, p. 566], producing subspherical galls, 5 to 30 mm. in diameter, the smooth surface of which sometimes showed characteristic sculpturing in the shape of small, regular, angular, brownish areas, probably due to unequal growth and tension in the tissue. Positive results were obtained only when the inoculations were made between January and April.

POUND (F. J.). **Studies of fruitfulness in Cacao.**—*Rep. Cacao Res., Trin., 1935*, pp. 16–19, 1936.

The record of badly blackened cacao pods resulting from infection by *Phytophthora palmivora* [*R.A.M.*, xiv, pp. 217, 566] in Trinidad in 1933–4 showed that potash had a restraining influence on the incidence of the disease, this effect being significant in the interaction of potash with phosphate though not in the main treatment analysis. Phosphate alone had no effect, but in combination with potash destroyed the beneficial effect of the latter.

PARODI (E.). **Sulle cause della decadenza della cultura del Cacao all' Ecuador e possibili remedi.** [On the causes of the decline of Cacao cultivation in Ecuador and possible remedies.]—*Agron. colon.*, xxx, 4, pp. 121–127, 5 figs., 1936.

Cacao production in Ecuador, which reached a maximum in 1920, has of recent years suffered a sensational decline as a result of witches' broom (*Marasmius perniciosus*) [*R.A.M.*, xiv, p. 430; xv, p. 202] and moniliasis (*Monilia roreri*) [ibid., xiii, p. 360], the available information on the effects and control of which is presented in a popular form. [A summary of this paper appears in *Riv. pat. veg.*, xxvi, p. 176, 1936.]

NEATBY (K. W.). **Factor relations in Wheat for resistance to Puccinia graminis tritici, Puccinia glumarum and Erysiphe graminis.**—*Phytopathology*, xxvi, 4, pp. 360–374, 1936.

All the data on *Puccinia graminis* presented in this tabulated account were obtained at Winnipeg, Canada, in 1929 and 1930 and have already been summarized from another source [*R.A.M.*, xii, p. 750]; the

remainder of the investigations was carried out at Cambridge, England, during 1933–4.

In the cross H–44–24×Marquis the seedling reaction to *P. glumarum* was found to be closely associated with mature plant reaction to *P. graminis* [ibid., xiv, p. 226; xv, pp. 351, 429, 430]. In the group of lines with mature plant resistance to *P. graminis* all those susceptible to *Erysiphe graminis* [ibid., xiv, pp. 88, 224, 229, 711] were resistant or moderately so to *P. graminis* form 36, and all susceptible or semi-resistant to the latter were resistant to *E. graminis*.

In Marquillo×H–44–24 semi-resistance to *P. glumarum* was found to be associated with the mature plant resistance of H–44–24 to *P. graminis*. Resistance in the seedling stage to form 52 of *P. graminis* was correlated with susceptibility to *P. glumarum*, and conversely, susceptibility to form 52 involved resistance to *P. glumarum*.

In Garnet×Double Cross the relationship between the seedling reactions to *P. graminis* form 35 and *P. glumarum* was similar to that operating in Marquillo×H–44–24 in respect of *P. graminis* form 52 and *P. glumarum*. Susceptibility to *P. graminis* form 21 was associated with red pigmentation of the straw.

Pleiotropism in the particular genes concerned in the relationships herein described is considered to afford a more plausible explanation of their development than genetic linkage.

NAOUMOVA (Mme N. A.). Влияние температуры и влажности воздуха на инкубационный период **Puccinia triticina.** [The influence of temperature and humidity of the air on the incubation period of *Puccinia triticina.*]—*Pl. Prot. Leningr.*, *1935*, 5, pp. 33–55, 1 diag., 5 graphs, 1935. [English summary. Received May, 1936.]

A tabulated account is given of the preliminary results of greenhouse experiments from 1932 to 1934, inclusive, in Leningrad, which showed that the optimum temperature for infection of spring wheat (Lutescens 062) with brown rust (*Puccinia triticina* form 13) and for the development of the rust pustules was about 25° C., with a maximum at about 30° (the lowest temperature tested was 15°). No infection resulted on inoculated leaves kept at 35° for six hours or more, even when the temperature was subsequently allowed to fall, and this temperature interrupted the development of the pustules which, however, resumed their growth after the temperature was lowered. Day temperature fluctuations between 15·6° and 23·6°, and between 18° and 29°, did not appreciably affect the growth of the intramatrical mycelium, but temperatures above 30° acting for several consecutive hours significantly lengthened the incubation period; this was observed to vary from 4 to 14 days within certain ranges of temperature. The development of the internal mycelium appeared to be stimulated by sharp fluctuations of the day temperature between 35° and 55°, associated with low night minima. Relative atmospheric humidity did not apparently affect the length of the incubation period.

The investigations indicated that the length of the incubation period of *P. triticina* is inversely proportional to the total minimum, mean, and maximum temperatures for the three days following infection. It was demonstrated that a nomogram [*R.A.M.*, xv, p. 523] may also be con-

structed for the determination of the length of the brown rust incubation period in the Leningrad region, according to the temperatures observed.

Shaw (F. J. F.) & Pal (B. P.). **Pusa 120: a Wheat highly resistant to yellow rust.**—*Agric. Live-Stk India*, vi, 2, pp. 202–203, 1936.

Pusa 120, one of the new Pusa wheats selected from the progeny of a cross between Pusa 52 and the Australian variety Federation, has been found in greenhouse tests by [K. C.] Mehta to possess a very high degree of resistance to the three physiologic forms of yellow rust [*Puccinia glumarum*] hitherto encountered in India [*R.A.M.*, viii, p. 489]. Considerable resistance to yellow rust in the field has also been manifested by P. 165, a strain derived from a cross between P. 4 and Federation.

Petit (A.). **Le charbon du Blé. Biologie—moyens de lutte.** [Loose smut of Wheat. Biology—means of control.]—16 pp., Tunis, Imprimerie Gorsse, Bascone & Muscat, 1936.

The author points out that the state of contamination of wheat seed by loose smut (*Ustilago tritici*) is not necessarily any indication of the amount of infection that will later develop in the crop. The only practical means of ascertaining whether wheat seed is heavily smutted is to sow a sample directly it is harvested and observe the earing that results, which will indicate the sanitary condition of the seed. As the disease is now general on the widely cultivated Florence×Aurore wheat in Tunisia the following steps should be taken at once.

A careful watch must be kept on all fields intended for seed production. No seed from any plot with over 1 to 2 per cent. smutted ears must be sown. On each farm about 0·1 to 0·5 per cent. of the seed harvested must be treated by immersion in water at 25° to 30° C. for 4 to 5 hours, followed by immersion for 10 minutes in water, the initial temperature of which is 53·5° to 54°, which should not be allowed to fall below 51·5° after the seed is poured in. The seed must then be very rapidly dried in air and treated with copper carbonate (250 gm. per quintal). Any smutted ears found in the plants grown must be removed and the clean seed so obtained again grown in order to obtain a sufficient quantity for future sowing.

Schlehuber (A. M.). **Can different degrees of bunt resistance be recognized in F_2 plants?**—*J. Amer. Soc. Agron.*, xxviii, 4, pp. 266–270, 1 graph, 1936.

Data are discussed and tabulated showing definitely that different degrees of resistance to bunt [*Tilletia caries*] can be recognized in F_2 plants of crosses between Oro and Hybrid 128 and White Odessa and Turkey-Florence wheats in Washington [*R.A.M.*, xv, p. 344]. The practical application of this fact is readily apparent. For instance, when bunt-free and 20 per cent. bunted F_2 plants are selected from a cross of this type, it is possible to obtain F_3 families with a higher degree of resistance than either parent, whereas the progeny resulting from crossing 50 and 80 per cent. F_2 individuals is not even as resistant as the

resistant parent. Bunt-free F_2 plants yielded five times as many resistant F_3 families as did the 20 per cent. bunted group.

BRYZGALOVA (Mme V.). Испытание противоголовневых фунгисидов в условиях лесостепной зоны Восточной Сибири. [Tests of fungicides for the control of cereal smuts in the forest-steppe zone of East Siberia.]—*Pl. Prot. Leningr.*, *1935*, 3, pp. 67–72, 1935. [Received May, 1936.]

After stating that in the forest-steppe zone of east Siberia all cereal crops, except rye, are more or less severely attacked by smut fungi, among which wheat bunt [*Tilletia caries* and *T. foetens*] is economically the most important, the author gives a tabulated account of tests in 1934 of a number of old and new seed disinfectants manufactured in the U.S.S.R. for the control of these diseases. With heavily bunted spring wheat seed the best control was given by formalin (1 in 300). With moderately infected seed-grain the copper carbonate dust AB [*R.A.M.*, xiv, p. 22] containing 16 to 20 per cent. copper gave satisfactory control at the rate of 150 gm. per cwt. of grain, while 300 gm. of the dust containing 9 per cent. copper were necessary to give commercial control of bunt with slightly infected seed-grain. Among the new dusts which were tried, relatively good control was afforded by A–12, B–10, and B–12 [the constitution of which is not given], N-arsin (100 gm. per cwt.) coming next in efficacy. The three first-named dusts slightly depressed the viability of the seed. The best control of loose smut of oats [*Ustilago avenae*] was given by formalin (1 in 80), which completely suppressed the smut, while Russian-prepared germisan [ibid., xv, p. 519] gave only very slightly inferior control.

AAMODT (O. S.), TORRIE (J. H.), & TAKAHASHI (K.). **The effect of several collections of Tilletia tritici and T. levis on the morphology of spring Wheats.**—*Phytopathology*, xxvi, 4, pp. 344–359, 2 figs., 1936.

The effect of bunt on the morphology of the spring wheat plant was studied at the University of Alberta, Edmonton, on six varieties, Reward, Little Club, Pentad, Hope, Kota, and Garnet, inoculated separately with one collection of *Tilletia tritici* [*T. caries*] and four of *T. levis* [*T. foetens*]. The culm length was reduced to approximately the same extent by infection with either species [*R.A.M.*, xi, p. 502] but spike elongation of diseased heads [ibid., xii, p. 155] occurred only in the more susceptible varieties, Reward, Little Club, and Kota. The general shape of the bunt balls was determined more by the variety than by any inherent property in the fungus [ibid., xi, p. 565]. The bunt balls of the single collection of *T. caries* used in the tests tended to be smaller and rounder than those of *T. foetens* (*Phytopathology*, viii, p. 106, 1918), but in general no consistent correlation could be established between culm length, spike elongation, and bunt ball shape.

NEILL (J. C.). **Experiments with two organic-mercury seed dusts.**—*N.Z. J. Agric.*, lii, 4, pp. 231–232, 1936.

In a test carried out in New Zealand naturally infected seed of Solid

Straw Tuscan wheat, Cape barley, and Algerian oats was dusted with agrosan G or ceresan U.T. 1875 (each at 2 oz. per bush.), a third portion being left untreated in each case. The agrosan G and ceresan U.T. 1875 reduced stinking smut of wheat [*Tilletia caries* and *T. foetens*] from 6·4 per cent. in the untreated plot to 0·06 and 0·04 per cent., respectively, the corresponding figures for barley covered smut [*Ustilago hordei*] being 0·33, 0, and 0 per cent., for oat smut [*U. kolleri* and *U. avenae*] 0·7, 0·15, and 0 per cent., and for stripe disease of oats [*Helminthosporium avenae*] 9·5, 1·9, and 0·01 per cent., respectively.

PEREVESENTZEVA (Mme M. S.). Пятипроцентный арсенит магния как протравитель. [Five per cent. magnesium arsenite as a seed disinfectant.]—*Pl. Prot. Leningr., 1935*, 3, pp. 73–76, 1935. [Received May, 1936.]

The [tabulated] results of the experiments briefly reported in this paper showed that 5 per cent. magnesium arsenite-talc dust (containing 4·79 per cent. arsenious oxide), with the addition of 3 per cent. acidol as sticker, was more toxic in the laboratory to wheat bunt spores [*Tilletia caries* and *T. foetens*] and gave (at the rates of 1 and 0·75 gm. per 1 kg. seed) a slightly higher degree of field control of the disease than Davydoff's preparation [*R.A.M.*, xiv, p. 22] containing 9·03 per cent. arsenious oxide used at the same rates; the resulting percentages of bunted plants in the progeny of artificially infected Caesium 0111 spring wheat seed were 0·5 and 0·8 with magnesium arsenite, 0·8 and 1·1 with Davydoff's dust, and 30·7 in the untreated controls. Both dusts had a stimulating effect on the germinability of the infected seed-grain. In experiments with proso millet [*Panicum miliaceum*] artificially infected with smut [*Ustilago panici-miliacei*: ibid., xv, p. 432], magnesium arsenite-talc dust (1 gm. per 1 kg. grain) reduced the percentage of infection in the progeny from 61·8 in the control to 5·4, and Davydoff's dust (same rate) reduced it to 1·2.

GORLENKO (M. V.). Бактериоз колосьев яровой Пшеницы и его вредоносность. [Bacteriosis of the ears of spring Wheat and its injuriousness.]—*Pl. Prot. Leningr., 1935*, 3, pp. 82–85, 1935. [Received May, 1936.]

The spring wheat Caesium 0111 is stated to have been widely and severely affected in 1933 and 1934 in several localities of the government of Voronezh by a bacterial disease of the ear, characterized by a very conspicuous malformation and brown to black discoloration both of the glumes and awns; the diseased ears were shorter and contained more rudimentary grains and sterile spikelets than the healthy. In 1933, the yield of the affected ears was shown to have been reduced by as much as 91 per cent. of the normal, while in the drier 1934 year the reduction in yield was not over 50 per cent. The specific gravity of the harvested grain was also reduced by 18·4 per cent. in 1933. Isolations from diseased material consistently yielded a bacterium which, except for some minor differences, in culture produced colonies identical with those of *Bacterium translucens* [*R.A.M.*, xiv, p. 17], and is believed to be a variant of this organism. This is stated to be the first record of this bacterium on spring wheats in Russia.

KHOKHRYAKOFF (M.). Малоизвестная болезнь озимых хлебов (склеротиния). [A little known disease of winter-sown cereals (*Sclerotinia*).] —*Pl. Prot. Leningr.*, *1935*, 4, pp. 94–97, 1935. [English summary. Received May, 1936.]

Following a severe outbreak of *Sclerotinia graminearum* [*R.A.M.*, v, p. 542] on winter-sown wheat and rye in the Gorki [formerly Nijni-Novgorod] region in 1934, which in many localities accounted for as much as 50 per cent. of the crops, the author gives a brief review of the information previously published on the disease in Russia. The trouble was first observed on a large scale in 1901 in the then Vyatka (now Kirov) region, since when it has been repeatedly recorded in the same region, as well as in other districts of Russia and the Ukraine, and in the Russian Far East. Observations show that it always appears in the spring, after the thawing of the snow, in the form of extensive patches of wilting plants, eventually involving the whole field. The disease somewhat resembles that caused by *Sclerotium rhizodes* [ibid., xiv, pp. 39, 766] but the latter only attacks the more mature plants. Spherical or elongated sclerotia, sometimes irregular or flattened, measuring 1·5 to 5 by 1 to 3 mm. in diameter, occur on and among the affected plants. On poorly fertilized, shallowly ploughed soil affected plants never recover, while on better cultivated and more fertile soils almost complete recovery may ensue. Clay and heavy soils are favourable to the disease, which usually occurs after abnormally wet and mild autumns, followed by similar winters, during which the snow cover persists late into the spring. Where crop rotation is not practicable the stubble of affected fields should be burnt and the remains deeply ploughed in, to prevent the germination of the sclerotia, before resowing with cereals. So far the fungus has not been observed to produce spores in nature, but it is believed highly probable that apothecia may develop from the sclerotia.

FUCHS (W. H.). **Die Getreidefusskrankheit im Gebiet von Halle.** [The cereal foot rot in the Halle district.]—*Kühn-Arch.*, xxxix, pp. 115–120, 1935.

Wheat foot rots in the Halle district of Germany, where they are responsible for substantial pecuniary losses, are stated to be mainly of the 'lodging' or 'straw-breaking' type, associated predominantly with *Cercosporella herpotrichoides* and *Fusarium* spp., chiefly *F. culmorum*, while a minor part is played by *Leptosphaeria herpotrichoides* [*R.A.M.*, xiii, p. 569; xiv, p. 351; xv, p. 85]; *Wojnowicia graminis*, which was present in 45 per cent. of the samples of stubble collected by F. Kauffert on a farm in the autumn of 1930, gave negative results in inoculation tests.

The 78 monospore lines of *L. herpotrichoides* were found in pure culture studies to fall into two groups, A (the more virulent) representing material supplied by Prof. Foëx and B that provided by the Centraalbureau voor Schimmelcultures, Baarn. Several strains of *F. culmorum* were also differentiated on the basis of variations in physiological and morphological characters and (to a slight extent) in pathogenicity. At 10° C. the damage caused by *F. nivale* [*Calonectria*

graminicola] (found, like *F. avenaceum*, in a few samples only) was much greater than that due to *F. culmorum*, whereas at 20° the positions were reversed [cf. ibid., x, p. 94; xii, p. 502].

In conformity with general experience, the writer's investigations showed the deleterious influence of summer barley as an immediate precursor of wheat in the rotation scheme. With potatoes the data were conflicting, while peas were not found to be suitable forerunners of wheat. Some reduction in the incidence of infection was obtained by soil treatments with lime, sulphuric acid, or iron sulphate, but the economic significance of direct control along these lines is regarded as dubious.

MOORE (M. B.). **A method for inoculating Wheat and Barley with loose smuts.**—*Phytopathology*, xxvi, 4, pp. 397–400, 1 diag., 1936.

The apparatus described consists essentially of a glass inoculating chamber, which is placed over wheat and barley heads and secured by a split rubber stopper. By means of a foot pump attached by a tube to the top of the chamber an aqueous spore suspension of the loose smut [*Ustilago tritici* or *U. nuda*: *R.A.M.*, viii, p. 765], made up in the proportion of about two fair-sized smutted heads in 100 c.c. of water, is drawn into it and when the head is covered the pinch cock on the tube supplying the suspension is closed. A partial vacuum created by the action of the pump expands the air in the florets, and the returning pressure replaces it with the liquid inoculum. By this method it is possible to inoculate up to 30 heads per hour. Up to 100 per cent. infection was secured with *U. tritici*, the maximum for *U. nuda* being 76 per cent. (average 26·4 per cent.). The most favourable stage of development for inoculation by this method is just after anthesis in most of the florets and before the ovaries have more than doubled their original size.

YU (T. F.). **Studies on stripe disease (Helminthosporium gramineum Rabh.) of Barley.**—*Agric. sinica*, i, 10, pp. 319–372, 4 figs., 1 graph, 1936. [Chinese, with English summary.]

A tabulated account is given of the results of ten years' studies on stripe disease of barley (*Helminthosporium gramineum*), which appears to be coextensive with the crop in China [*R.A.M.*, xiii, p. 24], causing an annual loss in the Kiangsu Province of 1·7 per cent. (computed on the basis of seven years' data).

In the diseased seeds the mycelium is found mostly between the pericarp and seed coat, being specially profuse near the embryonic region but not occurring in the embryo itself or penetrating deeper than the aleurone layer. Of the possible sources of infection, only mycelium hibernating in the seed-grain is of any practical importance. The conidia are too short-lived to cause infection of the second crop; no sclerotia or perithecia have been found in the field; and the inoculation of germinating seeds with diseased stubble gave negative results.

The best method of inoculation [ibid., xii, p. 161; xv, p. 288] is to spray the barley heads in the field with a spore suspension, equally good results being obtained at the milky or green mature stages or at any intervening period.

Liquid disinfectants have generally been found more efficacious than dusts in the control of *H. gramineum* [ibid., xiv, pp. 27, 28, 380; xv, p. 9], the best of the treatments tested under local conditions consisting of one to two hours' immersion of the seed-grain in 0·25 per cent. uspulun at room temperature. In a three-year trial of foreign and Chinese barleys for reaction to *H. gramineum*, a large number have remained free from infection.

A bibliography of 160 titles is appended.

HONECKER (L.). **Über den derzeitigen Stand und die Aussichten der Bekämpfung des Meltaubefalles der Gerste durch Züchtung.** [On the present status and prospects of the control of Barley mildew infection by breeding.]—*Prakt. Bl. Pflanzenb.*, xiii, 12, pp. 309–320, 1936.

Further observations are made on the position and prospects of barley mildew (*Erysiphe graminis*) [*hordei*] control by breeding in Germany [*R.A.M.*, xiv, p. 624], where the losses from this disease are stated to be steadily increasing of recent years. Infection is largely dependent on meteorological conditions and was greatly favoured in 1929, 1934, and 1935 by persistent drought in the spring and early summer months. At temperatures round about 20° C. the incubation period of the fungus is only four to five days, and two to three days later conidia are produced. The fungus overwinters in the conidial stage on volunteer plants and on the early sown winter crop, while the perithecia of the form of *E. graminis* on barley, in contrast to those of the wheat strain, appear to play little or no part in the spread of the disease.

During the period from 1921 to 1930, of which six years were favourable to more or less severe outbreaks of barley mildew in the Weihenstephan district of Bavaria, chemical analyses were made of the albumin content of the seed-grain of 43 susceptible brewing varieties compared with that of the fairly resistant Pflugs Intensiv. It was found that the average albumin content of the seed-grain of the susceptible varieties for the six mildew years was 12·15 per cent., the corresponding figure for Intensiv being 10·91 per cent.; in the remaining four years the percentages were 10·52 and 10·32 per cent., respectively. On the basis of experiments conducted throughout the country in 1934–5, the increase of yield associated with mildew resistance was estimated at roughly 10 per cent.

Five physiologic forms of *E. graminis* on barley have now been differentiated, viz., A, B, C (already referred to), D, and E. Of the two last-named, the former is an occasional concomitant of the widespread principal form A, while the latter (like C) was isolated only once. Form D appears to resemble B in its pathogenicity relations on test varieties, E being allied to C. For the present the following four varieties are recommended for the differentiation of physiologic forms (E being excluded) of *E. graminis hordei*: 4-rowed Hohenfinow (very susceptible to A, B, C, and D), Weihenstephan CP 127/422 (immune from A and D, very susceptible to B and C), Dalmatian Ragusa (immune from A and B, highly susceptible to C and D), and *Hordeum spontaneum nigrum* (immune from A, B, and D, and showing a mere

trace of infection by C). Form B seems to be on the increase in Baden and in the Palatinate.

The paper terminates with a discussion on the practical possibilities of selection of barley for resistance to the mildew.

RYAKHOVSKI (N. A.). Испытание новых протравителей и уточнение дозировок фунгисидов при борьбе с головней Овса и Проса. [Testing new seed disinfectants and more accurate determination of the doses of fungicides used for the control of Oats and Millet smuts.]—*Pl. Prot. Leningr.*, *1935*, 3, pp. 77–79, 1935. [Received May, 1936.]

The results of experiments in 1934 in the government of Voronezh showed that steeping oat seed-grain inoculated with loose smut [*Ustilago avenae*] in a 1 in 300 formalin solution reduced smut infection in the progeny from 3·47 per cent. in the control to 0·12 per cent. The semi-dry treatment with 1 in 80 formalin only reduced the smut to 0·55 per cent., while weaker solutions gave even less satisfactory results, as well as the liquid treatment with 0·25 Soviet-prepared germisan [see above, p. 564]. Smut [*Ustilago panici miliacei*: see above, p. 565] of millet [*Panicum miliaceum*] was also best controlled by steeping the inoculated seed in 1 in 300 formalin (0·42 against 55·17 per cent. infection); dusting the seed with NIIF-arsin at the rate of 1 or 1·5 gm. per 1 kg. grain came next in efficacy (0·45 and 1·02 per cent.), and the semi-dry method with 1 in 80 formalin at the rate of 1·5 l. per cwt. of grain, reduced the percentage infection to 0·72. The other treatments tested did not prove satisfactory.

PICHLER (F.). **Die Bekämpfung des Haferflugbrandes.** [The control of loose smut of Oats.]—*Neuheiten PflSch.*, xxix, 2, pp. 49–51, 1936.

Effective control of loose smut of oats [*Ustilago avenae*] was secured in experiments in Austria during 1934 and 1935 only by liquid disinfection of the seed-grain with 0·20 per cent. ceretan [ceresan] for 30 minutes, 0·25 per cent. formalin (15), 0·25 per cent. germisan (30), and 0·15 or 0·25 per cent. salvocer (60), all of which reduced the incidence of the disease from 14 per cent. to a trace, whereas the short disinfection process and dusting gave unsatisfactory results. Although the outcome of trials in 1934 to determine the influence of the sowing date on the amount of loose smut were not wholly conclusive, there was some indication that an improvement in the health of the stand may be effected by late spring (beginning to middle of May) planting.

HOLTON (C. S.). **Inheritance of chlamydospore characteristics in Oat smut fungi.**—*J. agric. Res.*, lii, 7, pp. 535–540, 1936.

The tabulated results of the tests briefly discussed in this paper showed that in crosses between *Ustilago levis* [*U. kolleri*] and the buff type of oat smut [*R.A.M.*, xv, p. 493] the factor for the production of brown chlamydospores is dominant, the distribution in the F_2 population of the brown and smooth, and of the hyaline and smooth chlamydospores being on a simple 3 : 1 basis. The same ratio also holds good for the distribution of the echinulate and smooth chlamydospores in F_2

populations of the hybrids between *U. avenae* and *U. kolleri*, the factor for echinulation being dominant. In crosses between *U. avenae* and the buff smut fungus the factors for echinulation and brownness are dominant over the factors for smoothness and hyalescence of the chlamydospores, the distribution in the F_2 populations of echinulate brown, smooth brown, and smooth hyaline spores being in the ratio 9 : 3 : 4. There was evidence indicating that echinulation in the hyaline chlamydospores of the buff smut is suppressed by the presence of an inhibitor.

GORLENKO (M. V.). К рационализации методов искоренения Слабительной Крушины. [On the rationalization of the methods for the eradication of Buckthorn.]—*Pl. Prot. Leningr., 1935*, 3, pp. 60–66, 1935. [Received May, 1936.]

A tabulated account is given of experiments in 1932 and 1933 in the region of Voronezh [south Russia], the results of which showed that *Rhamnus cathartica*, the alternate host of crown rust of oats [*Puccinia lolii*: *R.A.M.*, xv, p. 358 and next abstract] may be killed by the application of 2 per cent. sodium arsenate solution, a bush up to 2 m. high requiring 1 l., and larger bushes 2 l. Common salt heaped at the base of the bushes is equally efficient at the doses of 1 kg. and 2 kg., respectively. In using the liquid care should be taken to avoid spread-it over too wide a surface of the soil. It was further shown in 1934 that buckthorn bushes inside woods over 150 m. from the edge need not be eradicated, since the aecidiospores formed on them do not reach neighbouring oat fields.

GORLENKO (M. V.). Влияние агротехнических приемов на развитие корончатой ржавчины Овса. [The effect of agrotechnical methods on the development of crown rust of Oats.]—*Pl. Prot. Leningr., 1935*, 3, pp. 80–81, 1935. [Received May, 1936.]

The results of the field experiments in the government of Voronezh briefly discussed in this paper showed that both in a normal (1933) and in a weak rust year (1934) very early (28th March) and early (12th April) sowings of oats were very considerably less infected with crown rust [*Puccinia lolii*] (1·2 and 2·5 per cent. infection at milky maturity of the grain, respectively, in 1934) than average (20th April) and late (29th April) sowings in contiguous plots (4·2 and 15·6 per cent. respectively). Preliminary tests in 1934 tended to confirm Gassner's and Hassebrauk's findings regarding the rust-promoting effect of excessive nitrogen fertilizers [*R.A.M.*, xiii, p. 428]. Deep ploughing-under of oat stubble in the autumn or spring did not appear to reduce infection of buckthorn [*Rhamnus cathartica*: see preceding abstract] in the spring with crown rust, presumably because volunteer oats develop freely outside the oat fields, where they are difficult or impossible to suppress. All the standard oat varieties used in the south Russian black-earth belt were found to be equally susceptible to crown rust, but certain hybrids bred at the Voronezh Selection Centre, as well as the new pure line 0648 of the Tchakinskaya Cereal Station, and the Verkhnyatcheski pure line 053 in 1934 exhibited a high degree of resistance both to crown rust, and to stem rust [*Puccinia graminis*] and loose smut [*Ustilago avenae*].

Novotelnova (Mme N. S.). Некоторые наблюдения над условиями прорастания телейтоспор и базидиоспор **Puccinia graminis f. avenae** и уредоспор **Puccinia triticina.** [Some observations on the germination of the teleutospores and basidiospores of *Puccinia graminis* f. *avenae* and of the uredospores of *P. triticina*.]—*Pl. Prot. Leningr.*, *1935*, 4, pp. 98–106, 1935. [English summary. Received May, 1936.]

A summarized account is given of controlled experiments, the tabulated results of which showed that the teleutospores of *Puccinia graminis* f. *avenae* on oat straw kept over winter in an unheated glass-house failed to germinate in the spring, while those on straw kept outdoors germinated freely. The minimum temperature for germination was between 9° and 12° C., the optimum 22°, and the maximum 30°. The spores were killed after 24 hours' exposure to 30°, but temperatures below the minimum did not affect their viability. No germination of the teleutospores occurred at relative humidities below 100 per cent. They germinated equally well both in daylight and in the dark. The basidiospores of the rust only germinated in water, and their temperature relations were: minimum 6° to 9°, optimum 17°, and maximum 27° to 30°.

The optimum temperature for the germination of *P. triticina* uredospores was 20° to 25°, with a minimum at 9° and a maximum a little above 30°. Wetting of the spores at the minimum and optimum temperatures stimulated, and at the maximum depressed their germination. The viability of uredospores that were dried after wetting was considerably reduced, high temperatures during drying accelerating the loss in germinability.

Murphy (H. C.). **Reaction of the Victoria Oat variety to crown rust.**—*Phytopathology*, xxvi, 4, pp. 396–397, 1936.

Attention is drawn to the occurrence within certain stocks of Victoria oats, normally highly resistant to crown rust (*Puccinia coronata avenae*) [*P. lolii*: *R.A.M.*, xv, p. 492] and smuts (*Ustilago avenae* and *U. levis* [*U. kolleri*]) [ibid., xv, p. 493] of a few lines susceptible to the former disease and probably also to the latter, and breeders are recommended to use as parents only such pure-bred selections of the original variety as have undergone definite testing for their reactions to the fungi concerned. Although the resistance of Victoria to certain forms of *P. lolii* is not so complete as that of Bond (C.I. No. 2733), it nevertheless confers ample protection against the rust under ordinary field conditions.

Sprague (R.) & Johnson (A. G.). **A new Pseudodiscosia.**—*Mycologia*, xxviii, 2, pp. 181–185, 2 figs., 1936.

In 1932 a reddish-brown leaf spot was found on oats in Oregon, and more abundantly on the same host in Washington in 1934. The spots were of various shapes and sizes, and bore numerous conidia on very short conidiophores compacted together on a poorly developed stroma in the epidermis. The conidia germinated readily but invariably produced a very scanty growth, barely visible after six weeks, the mycelium

bearing conidia laterally, or terminally on short branches, in fan-shaped whorls. The fungus is regarded as a new species of *Pseudodiscosia* and is named *P. avenae*, with English and Latin diagnoses. The conidiophores are blunt or rarely sharply pointed, 5 to 12 by 0·8 to 2 μ. The conidia are narrowly fusiform, slightly curved, with one cilium at each end, hyaline or faintly yellow, 2 to 3 septate, and 10 to 42 by 2 to 4 μ, the basal cilium being rod-shaped or sometimes sharply pointed, 1 to 16 by 0·3 to 1·3 μ, attached obliquely near the hilum, and the apical cilium usually longer, very gradually merging with the body of the spore.

Sprague (R.). **Leaf reddening in winter Oats in western Oregon.**—*Plant Dis. Reptr*, xx, 6, pp. 114–115, 1936. [Mimeographed.]

A vivid red coloration is sometimes shown by autumn- and early spring-sown oats [*R.A.M.*, xv, p. 356] in western Oregon, especially in poorly drained soils, to which, however, it is by no means confined. The anthocyanin pigment responsible for the condition appears to be an index of a disturbed metabolism associated with various factors. Excessive soil moisture and resultant decrease in oxygen supply to the roots, combined with increased soil acidity and a depleted stock of available nitrogen in late winter, may be combated by the application to the soil of 100 lb. powdered calcium cyanamide per acre. Unduly luxuriant top growth, promoted by a lengthy vegetative season, and low temperature injury to the chloroplasts are apt to induce reddening, much of which is also due to foot rot (*Fusarium culmorum*). The 'red leather leaf' disease (*Pseudodiscosia avenae*) [see preceding abstract] was found to be very prevalent in the Willamette Valley in March, 1936. The Grey Winter and Shadeland Eclipse oats are resistant to red leaf, whereas the non-hardy Victory and Schoolmam are very susceptible.

Smith (F. L.). **The effect of Corn smut on the yield of grain in the San Joaquin Valley of California.**—*J. Amer. Soc. Agron.*, xxviii, 4, pp. 257–265, 1936.

Grain from 220 pairs of King Philip Hybrid maize plants attacked by smut (*Ustilago zeae*) in San Joaquin County, California, was weighed and analyses of the differences between this product and that of the same number of adjacent healthy plants analysed by Student's method (*Metron.*, v, p. 105, 1925). The losses due to the disease below the ear were estimated to be 7, 19, and 47 per cent. for small, medium, and large galls, respectively, the corresponding figures for the ear itself being 23, 41, and 82 per cent., respectively [*R.A.M.*, xiv, p. 750]. The percentage of barren stalks increased with the amount of smut, being 52 and 35, respectively, for large galls on and below the ear. No barren stalks were caused by single small galls or by medium-sized ones below the ear, but the latter on the ear resulted in 4 per cent. sterility. Multiple small and medium galls caused an increase in the percentage of barren stalks, which rose to 100 following infection by two or more large galls. The estimated loss in yield in a field with 17·4 per cent. smutted plants was 6 per cent.

STEVENS (N. E.). **Second experimental forecast of the incidence of bacterial wilt of Corn.**—*Plant Dis. Reptr*, xx, 6, pp. 109–113, 2 graphs, 2 maps, 1936. [Mimeographed.]

Assuming that winter temperature indices afford a comparatively reliable basis for predictions as to the extent and virulence of bacterial wilt of maize (*Aplanobacter stewarti*) [*R.A.M.*, xiv, p. 160; xv, p. 434], some reduction in the incidence of infection in Virginia and Maryland may be expected following the abnormally cold season of 1935–6, while in the Middle West, where the winter was of unprecedented severity, there should be a decided regression in the amount of the disease, a delay in its appearance, and an arrest of its northward progress. In New York and New England little change is to be anticipated.

POOS (F. W.) & ELLIOTT (CHARLOTTE). **Certain insect vectors of Aplanobacter stewarti.**—*J. agric. Res.*, lii, 8, pp. 585–608, 13 figs., 1936.

Continuing their studies on bacterial wilt (*Aplanobacter stewarti*) of maize in the United States [*R.A.M.*, xiv, pp. 94, 752], the authors give a tabulated account of investigations, carried out largely in 1934, the results of which confirmed the view that the disease is not transmitted through the soil. The wilt was transmitted directly from infected to healthy maize plants by the beetles, *Chaetocnema pulicaria*, *C. denticulata*, and *Diabrotica duodecimpunctata*; eight other species of insects which were collected on or near wilted maize plants yielded *A. stewarti* when tested for its presence. Of 908 adults of *C. pulicaria* collected from maize at Arlington Experiment Farm from May to September, 1934, an average of 40·3 per cent. yielded the parasite, which was also found to be present in an average of 12·1 per cent. of the adults of the same species collected from other host plants. The maximum proportion of isolations of *A. stewarti* obtained from this species was 75 per cent. Of 684 adults that were collected and tested just before hibernation, 13·1 per cent. yielded the organism.

Inoculations by needle and by *C. pulicaria* showed that teosinte (*Euchlaena mexicana*) [loc. cit.] and Job's tears (*Coix*) [*lacryma-jobi*] are also hosts of *A. stewarti*. The amount of bacterial wilt in eastern New York and in New England was much reduced in 1934, as compared with the two preceding years, following the low temperatures during the previous winter, indicating that winter temperatures may be very significant for the purpose of forecasting destructive outbreaks of the disease [see preceding abstract].

PASINETTI (L.). **Studio sulla 'bacteriosi del Mais' da 'Aplanobacter stewarti' Smith osservata per la prima volta in Italia.** [A study on Maize bacteriosis caused by *Aplanobacter stewarti* Smith observed for the first time in Italy.]—*Riv. Pat. veg.*, xxvi, 3–4, pp. 61–84, 2 figs., 1936.

In the summer of 1935, maize of a local variety growing on a very compact soil in a damp, warm district near Milan showed 10 to 15 per cent. infection by *Aplanobacter stewarti* [see preceding abstract], this being the first record of the disease in Italy. Inoculations of maize

seedlings with pure cultures of the organism made in the collar by means of a syringe and in the leaves by needle prick gave slight infection on a few leaves only. The outbreak is considered to have been favoured by exceptional weather conditions prevailing over a limited area.

MÖLLER. **Beizt auch das Mais-Saatgut! Beobachtungen über die Wirkung von Ceresan (U.T. 1875a) auf Maiskeimlinge.** [Steep Maize seed-grain too! Observations on the action of ceresan (U.T. 1875a) on Maize seedlings.]—*Dtsch. landw. Pr.*, lxiii, 15, p. 184, 1936.

Encouraging results were given in the writer's laboratory experiments in the control of seed-borne fungi on maize, including *Gibberella saubinetii*, *Diplodia* [*zeae*], and *Basisporium* [*Nigrospora* sp.: *R.A.M.*, xiv, p. 751], by treatment with ceresan U.T. 1875a, and it is recommended that this precautionary measure should be widely practised in Germany.

FULLER (C. H. F.). **Micro-organisms in Breadmaking.**—*J. Soc. chem. Ind., Lond.*, lv, 14, pp. 93T–94T, 1936.

A brief review is given of recent developments in the control of bread spoilage by moulds (*Aspergillus*, *Penicillium*, *Mucor*, *Monilia*, and *Rhizopus* spp.) [*R.A.M.*, xiv, p. 691]. Attention is also drawn to proposals for the addition to the yeast, *Saccharomyces cerevisiae* [ibid., xiv, p. 383], commonly used in bread manufacture, of other micro-organisms with enzymatic properties such as *A. oryzae* [ibid., xiv, p. 784] or *Penicillium* (Arkady patent).

FAWCETT (H. S.). **Citrus diseases and their control.**—Second edition, xv+656 pp., 15 col. pl., 169 figs., 2 graphs, 1 map, New York and London, McGraw-Hill Book Company, Inc., 1936. Price 36*s*.

The author states in his preface to this second edition of his work (originally undertaken in collaboration with H. A. Lee, whose participation has since been withdrawn) on citrus diseases and their control [*R.A.M.*, v, p. 735] that the entire book has been thoroughly revised, most of the sections rewritten (in some cases with the help of specialists), and a number of new ones added. The latter include, *inter alia*, sections on 'mal secco' (*Deuterophoma tracheiphila*) [ibid., xv, p. 361], sweet orange fruit scab (*Sphaceloma fawcettii* var. *viscosa*) [ibid., xv, p. 362], Australian citrus scab (*S. fawcettii* var. *scabiosa*) [ibid., xv, p. 436], hard root rot (*Rhizoctonia lamellifera*) [ibid., xii, p. 727], *Macrophomina* root rot (*M. phaseoli*) [ibid., xiv, p. 670], cotton root rot (*Phymatotrichum omnivorum*) [ibid., x, p. 241], red root disease (*Sphaerostilbe repens*) [ibid., xii, p. 21], and little leaf [ibid., xiv, pp. 505, 768]. Psorosis, now regarded as a virus disease [ibid., xiii, p. 692], is discussed in full from this standpoint. A new chapter on diseases caused by deficiency and excess of inorganic constitutents [cf. ibid., xi, p. 570] is also added and a very complete bibliography (41 pp.) down to 1935 is appended. The edition forms a most valuable revision of this standard work and will no doubt prove indispensable to those engaged in the study of these diseases.

BITANCOURT (A. A.) & JENKINS (ANNA E.). **Elsinoe fawcetti, the perfect stage of the Citrus scab fungus.**—*Phytopathology*, xxvi, 4, pp. 393–395, 1 fig., 1936.

English and Latin diagnoses are furnished of *Elsinoe fawcetti* n. sp., the causal organism of scab lesions on Satsuma orange (*Citrus nobilis unshiu*) rind in San Paulo, Brazil. Although attempts to establish the genetic connexion of the fungus with *Sphaceloma fawcettii* [*R.A.M.*, xv, p. 436] by means of ascospore cultures failed, there is considered to be no doubt as to the relationship, since the injuries are typical of scab and the conidial stage (*S. fawcettii*) is present on the younger lesions of the specimens (on the leaves). The perfect stage, moreover, closely resembles those of other species of *Sphaceloma*, e.g., *E. ampelina* [ibid., xv, pp. 468, 477], *E. piri* [ibid., xiv, pp. 223, 815], and *E. phaseoli* [ibid., xiii, p. 345]. The globose to ovoid asci of *E. fawcetti*, of which 1 to 20 or more occur in a single pulvinate, dark brown, circular to elliptical ascoma, 38 to 106 by 36 to 80 μ, measure 12 to 16 μ in diameter and contain hyaline, oblong-elliptical, uni- to triseptate ascospores, 10 to 12 by 5 to 6 μ.

SAREJANNI (J. A.). **Le 'mal secco' en Grèce.** ['Mal secco' in Greece.] —*Ann. Inst. phytopath. Benaki, Greece*, i, 3, pp. 61–66, 1935. [Received July, 1936.]

Mal secco disease (*Deuterophoma tracheiphila*) [*R.A.M.*, xv, p. 361] causes considerable damage to lemon and citron trees in Greece. The author frequently isolated *D. tracheiphila* from citrons, lemons, and bitter oranges in all the localities where the disease was present, the chromogenic and non-chromogenic strains [ibid., x, p. 183] occurring together, one or the other predominating in different districts. The pycnidia, found from March to May in the Peloponnese and Crete, ranged from 34 to 104 μ in diameter, the spore measurements being 2·5 to 4 by 0·7 to 1·5 μ.

Other citrus diseases which may be confused with mal secco in Greece are: wither-tip (*Colletotrichum gloeosporioides*); gummosis of the collar due to a *Phytophthora*; leaf fall and branch desiccation caused by *Bacterium* [*Pseudomonas*] *citriputeale*; and the injuries due to frost, drought, or high winds.

An orchard of lemon trees grafted over 20 years ago on mandarin orange trees, themselves grafted on sour orange, has consistently shown marked resistance to infection.

CASELLA (D.). **Le malattie degli Agrumi e lo stato attuale dei rimedi relativi.** [Citrus diseases and the present status of the appropriate control measures.]—*Ann. Staz. Agrum. Frutt. Acireale*, N.S., ii, pp. 239–253, 1935. [Received April, 1936.]

Full practical notes designed to assist growers are given on the prevention and control by improved cultural and sanitary practices, chemical treatments, and the development of resistant varieties, of the following citrus diseases in Sicily: *Rhizoctonia* damping-off [*R.A.M.*, xv, p. 361], root rot and gummosis due to *Phytophthora citrophthora* and *P. parasitica* [ibid., xiii, p. 301; xiv, p. 505; xv, pp. 364, 541] and 'mal secco' (*Deuterophoma tracheiphila*) [see preceding abstract].

Fawcett (H. S.), Klotz (L. J.), & Nixon (H. W.). **Effects of storage and holding conditions on Alternaria in Lemons.**—*Calif. Citrogr.*, xxi, 4, pp. 118, 143–144, 2 graphs, 1936.

In an experiment carried out in California in 1935 to ascertain the effect of different storage conditions on the development of *Alternaria* decay in lemons one lot of fruit was placed in the best obtainable conditions of natural ventilation and another comparable lot in air-conditioned refrigeration. After approximately six months' storage the lemons were submitted to the effects of different temperatures.

The data obtained [which are tabulated] showed that the refrigerated lemons (lot A) were superior in keeping quality to the others (lot B), representative samples of 100 fruits showing 33 and 59 per cent. indications of infection in lots A and B, respectively. In lot A 36 per cent. and in B only 5 per cent. of the lemons had green buttons. After two weeks' further storage at 36° F., 47·5 per cent. of the fruit in lot A and 60 per cent. in lot B showed infection or indications of infection, lot A having no well-developed decay, while lot B had 5 per cent. visible decay. From 59° upwards lot B showed a rapid increase in infection, lot A not showing this increase until 65° was reached. At 90° both lots showed numerous fruits which emitted a bad odour and in which the juice sacs were broken down and desiccated.

The greater resistance of lot A to breakdown as compared with lot B is explained by the more constant temperature and humidity of the refrigerated storage and the smaller accumulation therein of deleterious substances. The greater amount of decay in lot B was correlated with the higher percentage of black buttons in this lot, the fungus being found under all the black ones though absent under all the green ones. There was no indication that the refrigerated storage predisposed the fruit to rapid breakdown subsequently, the condition of the fruit on removal from storage being, apparently, a reliable indication of later keeping quality.

Klotz (L. J.). **Nitrogen trichloride and other gases as fungicides.**—*Hilgardia*, x, 2, pp. 27–52, 5 figs., 2 graphs, 1936.

This is an expanded account of investigations already noticed from another source [*R.A.M.*, xiv, pp. 163, 628].

Johnston (J. C.). **Suggestions on mottle-leaf control for Tulare County.**—*Calif. Citrogr.*, xxi, 5, p. 159, 1936.

Californian experience has shown that the best control of citrus mottle leaf [*R.A.M.*, xv, p. 363] consists in spraying, preferably with zinc oxide 3 lb. per 100 galls. water. Once control has been secured spraying should be continued, using a mixture at one-third of this concentration. If it is desired to use lime-sulphur this should be combined (at the strength required) with 8 lb. zinc sulphate (25 per cent.) per 100 galls. spray, the amount of zinc being varied according to the severity of the disease, and to maintain control 3 lb. zinc sulphate should be used per 100 galls. A good spreader should be used with these sprays. Late winter or spring applications are the most effective. Treated orchards should be given adequate fertilization and carefully controlled irrigation, and tillage should not be deep or excessive.

Morstatt (H.). **Kaffee-Schädlinge und -Krankheiten Afrikas. (Fortsetzung.)** [Coffee pests and diseases in Africa. (Continuation.)] —*Tropenpflanzer*, xxxix, 3, pp. 91–118, 8 figs., 1936.

In this paper [the first part of which, appearing in the same journal in October, 1935, dealt with insect pests], the writer summarizes the available information on diseases affecting coffee in Africa. Most of the work discussed has already been noticed in this *Review*.

Taubenhaus (J. J.). **Phymatotrichum root rot on winter and spring weeds of South Central Texas.**—*Amer. J. Bot.*, xxiii, 3, pp. 167–168, 1936.

Recent studies in south-central Texas demonstrated the capacity of *Phymatotrichum omnivorum* [*R.A.M.*, xv, p. 438] to overwinter on 14 winter and spring weeds, e.g., wild cotton (*Gossypium* sp.), two species of *Ipomoea*, three of *Lactuca*, *Malva rotundifolia*, *Medicago arabica*, and *Vicia reverchonii*, commonly found growing on fallow land and in fields permanently under cotton or maize. Such plants may therefore play an important part in the perpetuation of root rot by acting as bridging hosts for the spread of the fungus to succeeding cotton crops or to the summer annual and perennial weeds nearly always present in maize or fallow fields.

Fedotova (Mme T. I.). Серологический метод определения сортоустойчивости Хлопчатника к заболеваниям. [Serological method for the determination of varietal resistance to disease in Cotton.] —*Pl. Prot. Leningr., 1935*, 5, pp. 11–32, 1935. [English summary. Received May, 1936.]

Preliminary studies described in some detail in this paper showed that the globulin fraction of the albumin extracted from the seed of a number of varieties of *Gossypium barbadense*, *G. hirsutum*, and *G. herbaceum*, reacted either positively or negatively with sera derived from rabbits sensitized by injection with cultures of *Verticillium dahliae*, *Fusarium buharicum* [*R.A.M.*, xv, p. 457] and *Bacterium malvacearum* [cf. ibid., xiv, p. 430], according to whether the varieties were susceptible or resistant to attack by these micro-organisms in the field. There also were indications that the degree of susceptibility or resistance of the varieties could be fairly accurately estimated by the intensity of the reaction.

A bibliography of 198 titles is appended.

Sarejanni (J. A.) & Cortzas (C. B.). **Note sur le parasitisme du Macrophomina phaseoli (Maubl.) Ashby.** [A note on the parasitism of *Macrophomina phaseoli* (Maubl.) Ashby.]—*Ann. Inst. phytopath. Benaki, Greece*, i, 3, pp. 38–44, 1935. [Received July, 1936.]

Early in October, 1934, cotton plants of the native variety 'Dadiotico' (*Gossypium herbaceum*) were observed in various localities in Greece to be wilted as a result of attack by *Macrophomina phaseoli* [*R.A.M.*, xv, p. 426]. The fungus was also noted on sesame, bean [*Phaseolus* sp.] (of which 100 hectares were destroyed near Copais in 1935), citrus, eggplant, and large-flowered chrysanthemum (on which

general chlorosis is produced), and in the pycnidial stage on sesame and bean only. On cotton, sesame, and bean the sclerotia measured 45 to 150 by 45 to 120 μ, and are therefore referable to Haigh's group C [ibid., xiv, p. 671]. The fungus appears to be identical with that reported on sesame from the Philippines by Petrak as *M. philippinensis* [ibid., vi, p. 757].

In the affected cotton fields *M. phaseoli* killed 5 to 40 per cent. of the plants, the attack lasting from August to October and being noted only on fully grown plants. The total loss was about one-third or one-quarter of the incidence.

Histological examination of diseased material showed that the phelloderm was not attacked by the mycelium, which apparently effected its entry through cracks in this tissue and destroyed the cells but not the fibres of the liber. It then spread to the wood. In American varieties, which though growing in the infected area had remained unaffected, the phelloderm was much thicker than in the Dadiotico variety, and this fact may explain the absence of the disease on cotton in the United States [cf. ibid., xiv, p. 670].

A list is given of 93 plants on which *M. phaseoli* has so far been recorded.

STEYAERT (R. L.). **Étude des facteurs météorologiques régissant la pullulation du Rhizoctonia solani Kühn sur le Cotonnier.** [A study of the meteorological factors controlling the development of *Rhizoctonia solani* Kühn on the Cotton plant.]—*Publ. Inst. nat. Étud. agron. Congo Belge* 7 (Sér. sci.), 27 pp., 3 figs., 1936.

During the past two years cotton in the Belgian Congo has suffered rather severely from seedling damping-off caused by *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xi, p. 454; xiv, p. 223]. Both micro- and macroscopically the fungus showed the characters of *C. solani*, the hyphae being approximately 7·5 (up to 10) μ in diameter and the lateral branches emerging at right angles and being slightly constricted at the proximal end. The pseudo-sclerotia sometimes attained a diameter of 4 mm. Other hosts of *C. solani* in the Belgian Congo include *Canavalia ensiformis*, *Centrosema plumieri*, *Calopogonium mucunoides* (on all of which it produces leaf infections), *Crotalaria retusa* (on which the mycelium spreads up the stem, bringing about the death of the leaves), *Abroma augusta*, *Bidens pilosa*, carrot, and *Tagetes* sp.

Two years' experiments made to ascertain the effect of meteorological conditions on infection showed that the chief factor in a tropical area is the amount of sunlight, which determines the soil temperature, a low soil temperature favouring an outbreak of the disease. Meteorological factors adverse to the seedlings are favourable to the fungus, and on the whole, the best period for sowing under the local conditions would appear to be from 6th until 20th July. Triumph cotton, which has become acclimatized, showed more resistance than recently introduced varieties. Seed disinfection in some cases gave very unsatisfactory results and is considered to be too expensive under Belgian Congo conditions. The most suitable control measures consist in improved cultural methods, shading, and soil aeration.

Karling (J. S.). **Fungi of British Honduras. I.**—*Ann. mycol., Berl.*, xxxiv, 1–2, pp. 1–10, 3 pl., 1936.

A full description is given of the fungus *Hypocrella* (*Aschersonia*) *turbinata* (Berk.) Petch [*R.A.M.*, xv, p. 216] observed by the author parasitizing the wax scale (*Ceroplastes floridensis*) on lime leaves, petioles, and fruits in north-western British Honduras.

Lysaght (Averil M.). **A note on an unidentified fungus in the body cavity of two Thysanopterous insects.**—*Parasitology*, xxviii, 2, pp. 293–294, 1 fig., 1936.

In the body cavity of 35 out of some 17,000 specimens of *Aptinothrips rufus*, collected from grass plots at Rothamsted in 1933–35, the writer detected a profusion of hyaline, straight or slightly curved, often vacuolar spores, 40 to 60 by 10 μ, belonging to a hitherto unidentified fungus, which was also found in one out of 100 specimens of *Limothrips cerealium*, collected on wheat in 1934. Except in one case of slight infection, the fungus induced sterility in the insects, which showed, however, no conspicuous external signs of disease. Infection is most common in the spring and early summer.

Dey (W. C.) & Maplestone (P. A.). **Favus in India.**—*Indian J. med. Res.*, xxiii, 3, pp. 687–699, 5 pl. (2 col.), 1 fig., 1936.

A full account is given of the authors' morphological and cultural studies of a species of *Achorion*, with spores 4 to 6 μ in diameter, isolated from the scalp of a 16-year-old girl at Calcutta. On nearly all media the colonies are faviform, with a white, chalky, powdery appearance at first, later becoming glabrous. The chlamydospores of the fungus resemble those of *A. schoenleini*, but the former is also characterized by peculiar funnel-shaped terminal chlamydospores. Arthrospores, mycelial racquets, pectinate hyphae, and aleuriospores were also observed. In liquid media the Indian fungus forms a flocculent growth in contrast to the granular development of *A. schoenleini*, and it further differs in its cultural reactions from *A. formosensum* [*R.A.M.*, vii, p. 169] (spore diameter 3 to 4 μ) and *A. schoenleini* var. *mongolica* [ibid., xv, p. 501]. The name proposed for the writers' organism is *A. actoni* n.sp.

Catanei (A.). **Les teignes dans les agglomérations indigènes de l'Aurès.** [Ringworm among the native centres of population of Aurès.]—*Arch. Inst. Pasteur Algér.*, xiv, 1, pp. 9–14, 1936.

Ringworm was found to be comparatively rare among the native population of the Aurès mountains (department of Constantine, Algeria), only 63 out of 528 children (under 16 years) being affected, of whom 45 (8·5 per cent.) suffered from favus (*Achorion schoenleini* [see next abstract] and 18 (3·4 per cent.) from trichophytosis (*Trichophyton glabrum* and *T. violaceum*) [*R.A.M.*, xiii, p. 577; cf. also xv, p. 152].

Kitchevatz (M.) & Milochevitch (S.). **Aspects cliniques de favus provoqués par le 'trichophyton faviforme album'.** [Clinical aspects of favus induced by *Trichophyton faviforme album*.]—*Bull. Soc. franç. Derm. Syph., 1936*, pp. 579–581, 1936.

The constant agent of favus of the scalp in Jugo-Slavia is stated to

be *Trichophyton faviforme album* [*T. album*: *R.A.M.*, xiv, p. 104], and details are given of the clinical and cultural data and inoculation tests on laboratory animals on which the classification of the fungus was based. The practical interest of this discovery lies in the animal origin of the species, *Achorion schoenleini*, the common agent of the trouble in question elsewhere [ibid., xv, p. 94], being a 'human' type.

DE CISNEROS (J. M. G. J.) & VALLEJO (L. V.). **Contribución al conocimiento de la flora dermatofítica en las policlínicas de Madrid.** [A contribution to the knowledge of the dermatophytic flora in the general hospitals of Madrid.]—*Act. dermo-sifilogr., Madr.*, xxviii, 2, pp. 107–117, 1935.

Of the 150 cases of dermatomycosis examined at various hospitals in Madrid, 64 (42·6 per cent.) were found to be of fungal origin, 16 (28 per cent.) being due to *Microsporon audouini*, 9 (16·4 per cent.) to *Achorion schoenleini*, 22 (39·2 per cent.) to *Trichophyton* spp. (*T. violaceum*, *T. crateriforme*, *T. gypseum asteroides* [*T. mentagrophytes*], and *T. faviforme album* [*T. album*: see preceding abstract]) and 9 (16·4 per cent.) to *Epidermophyton* spp. (*E. inguinale* [*E. floccosum*] and *E.* Kaufmann-Wolf) [ibid., xv, p. 219].

VENTURI (F.). **Su alcuni reperte di Trichophyton in un caso di kerion.** [On some manifestations of *Trichophyton* in a case of kerion.]—*Boll. Sez. reg.* (*Suppl. ital. Derm. Sif.*), xiv, 1, pp. 13–14, 1936.

Clinical details are given of a case of kerion of the scalp, with secondary involvement of the body, in a six-year-old girl. A species of *Trichophyton*, considered by Prof. Pollacci to be probably identical with *T. persicolor* [*R.A.M.*, xv, p. 366], and *Sporendonema epizoum* [ibid., xiii, p. 700] were isolated from the affected areas and the blood stream.

ARTOM (M.). **Su alcune micosi cutanee.** [On some cutaneous mycoses.]—*Boll. Sez. reg.* (*Suppl. ital. Derm. Sif.*), xiv, 1, pp. 42–43, 1936.

Brief notes are given on some cutaneous mycoses observed at Verona and considered to be of special interest by reason either of the rarity of the fungi concerned or of the clinical manifestations induced. *Cephalosporium acremonium* [*R.A.M.*, xv, pp. 220, 501] was isolated from a case of sycosis of the beard in a 36-year-old man; *Trichophyton persicolor* [see preceding abstract] from the arm of a male infant; *Microsporon equinum* [ibid., xiv, p. 581] (new to the locality) from a three-months-old infant; and *M. ferrugineum* [ibid., xv, p. 293] and *M. japonicum* [ibid., xiv, p. 35] from two brothers from Calabria, the former producing common herpes tonsurans and the latter an aggravated form of kerion. The possibility that the two last-named species may be merely varying manifestations of a single fungus is suggested by the circumstances of the case, which point to an identical source of infection.

DODGE (C. W.) & MOORE (M.). **Morphology, physiology and cytology of Syringospora inexorabilis (Monilia inexorabilis).**—*Ann. Mo. bot. Gdn*, xxiii, 1, pp. 129–150, 2 pl., 1936.

A study of *Syringospora* (*Monilia*) *inexorabilis* [*R.A.M.*, xii, p. 289] isolated by Mazza and Palamedi from a fatal case of blastomycosis of the skin and mucosa showed that in the host the fungus exists as a single or budding yeast-like cell. When the organism is cultivated on an artificial medium the cells send out germ-tubes or elongate to produce hyphae 2 to 5 μ in diameter, in which cross walls are formed. On several media, however, the yeast-like budding cells, measuring 2 to 17 μ in diameter, may persist or predominate for a variable length of time. The filaments formed on media with beef extract near the neutral point or with a high P_H value are generally long, with a small diameter. On wort agar the organism becomes very large, spherical, and thick-walled. A verticillate or dendroid growth is common on most media and characteristic on Raulin's solution. The uninucleate blastospores are spherical to ovoid or subpiriform to piriform and measure approximately 3 to 6 (usually 5 or more) μ in diameter. Large, terminal, clavate, or obovate cells 9 to 15 μ in diameter or long axis are also present, and lanceolate cells 9 to 15 μ in long axis also occur.

Talice and Mackinnon reduced the fungus to synonymy with *Syringospora albicans* under the synonym *Mycotorula albicans* (Robin) Langeron & Talice. The present authors, however, on grounds of difference in cultural behaviour and in its much greater virulence, consider that it should be named *S. inexorabilis* (Mazza & Palamedi) Dodge [to which genus it was transferred in Medical Mycology, p. 242: ibid., xv, p. 368], *M. albicans* Talice & Mackinnon being a synonym. Notes are given on a number of related species.

GUILLAIN (G.), BERTRAND (I.), & LEREBOULLET (J.). **Étude anatomo-clinique sur un abcès mycosique du lobe frontal.** [An anatomo-clinical study of a mycotic abscess of the frontal lobe.]—*Rev. neurol.*, lxiv, 5, pp. 684–689, 4 figs., 1935.

Clinical, anatomical, and histological details are given of a fatal case in a 33-year-old woman of an abscess in the frontal lobe of the brain. The fungus formed in the affected region presented the general characters of an *Aspergillus*, the exact identification of which by cultural studies was, however, impracticable. Two similar cases in recent French medical literature are briefly reported. In the writers' patient an ocular focus of infection is suspected.

MARKLEY (A. J.), PHILPOTT (O. S.), & WEIDMAN (F. D.). **Deep scopulariopsosis of ulcerating granuloma type confirmed by culture and animal inoculation.**—*Arch. Derm. Syph., Chicago*, xxxiii, 4, pp. 627–641, 7 figs., 1936.

This is a comprehensive clinical and cultural study of a case of ulcerating granuloma involving the inguinal, perineal, and gluteal regions in a young woman and tentatively referred to *Scopulariopsis brevicaulis* [*R.A.M.*, xv, p. 297]. Inoculation experiments on laboratory animals indicated that the pathogenic capacity of the fungus is not

very great, though it may remain viable in the tissues for 37 days and induce endothelioid or suppurative granuloma.

MIDANA (A.). **Sporotricosi localizzata con linfangite ed adenite.** [Localized sporotrichosis with lymphangitis and adenitis.]—*Boll. sez. reg.* (*Suppl. ital. Derm. Sif.*), xiv, 1, p. 29, 1936.

Sporotrichum beurmanni [*R.A.M.*, xv, p. 294] was isolated from a case of lymphango-adenitis of the hand and arm [brief clinical details of which are given] in a male patient at Turin.

GOUGEROT [H.] & BURNIER [R.]. **Sporotrichose lymphangitique bilatérale. Sporotrichose professionnelle: accident du travail.** [Bilateral lymphangitic sporotrichosis. Occupational sporotrichosis accidentally contracted at work.]—*Bull. Soc. franç. Derm. Syph.*, *1936*, 1, pp. 69–70, 1936.

Sporotrichum beurmanni [see preceding abstract] was isolated from lymphangitic lesions on both arms of a gardener whose work exposed him to the continual risk of wounds from *Phoenix* thorns [cf. *R.A.M.*, xi, p. 647].

DAVIDSON (A. M.) & GREGORY (P. H.). **The so-called mosaic fungus as an intercellular deposit of cholesterol crystals.**—*Canad. med. Ass. J.*, xxxiv, 3, pp. 277–278, 4 figs., 1936.

Since the writers' original discovery that the so-called 'mosaic fungus' can be resolved into an aggregation of rhombic cholesterol crystals [*R.A.M.*, xv, p. 152], scales from a number of other patients have been examined and the crystalline nature of the structure amply confirmed. The crystals are arranged in masses which constitute the irregular angular segments of the mosaic. Cold potash gives the best specimens, but the crystals can also be detected in dry scales soaked in xylol and mounted in Gurr's neutral mounting medium, so that there is no justification for regarding them merely as artifacts incidental to the use of potash. The crystals may or may not bear some relation to ringworm infection but certainly do not in themselves constitute evidence of its presence.

NICHOLS (AGNES A.). **The bacteriology of canned milk products.**—*J. Soc. chem. Ind., Lond.*, lv, 12, pp. 78T–80T, 1936.

In studies at the Hannah Dairy Research Institute, Kirkhill, Ayr, it was ascertained that the reddish-brown 'buttons' sometimes observed on the surface of sweetened condensed milk are due to *Aspergillus repens*, contamination by which is thought to occur after the milk has left the vacuum pan either through the atmosphere or by the use of infected plant or containers.

GOMEZ-MENOR (J.). **Hongos que atacan al Rosal.** [Fungi that attack the Rose.]—*Rev. Agric., S. Domingo*, xxvii, 78, pp. 2304–2305, 1 fig., 1936.

Popular notes are given on the rose diseases caused in the Dominican Republic by *Actinonema* [*Diplocarpon*] *rosae* [see above, p. 559] and

Pestalozzia discosioides and on their control by spraying with ammoniacal copper carbonate or Bordeaux mixture.

GREEN (D. E.). **The ink disease (or bulb scab) of Iris reticulata caused by Mystrosporium adustum Massee.**—*J. R. hort. Soc.*, lxi, 4, pp. 167–175, 5 pl., 1 fig., 1936.

Following an outline of the history of ink disease of *Iris reticulata* (*Mystrosporium adustum*) [*R.A.M.*, xiv, p. 12], its symptoms, morphology, and physiology, the writer describes a series of experiments at the Royal Horticultural Society's Garden, Wisley, Surrey, from which it was apparent that the planting of bulbs with inky markings led to a gradual decrease in numbers, especially in unsterilized garden soils where secondary agents of decay are active. Disappointing results were given by the various standard methods of control tested, and the safest practice is probably to destroy all bulbs with black areas on the inner fleshy portion and to remove any infected outer scales. Even when the discoloured patches were excised and the bulbs immersed for an hour in 2 per cent. formalin, infection persisted on a fair percentage of the progeny, showing the need for protracted isolation of such stocks if they are to be retained at all.

PAPE (H.) & MARGGRAF (M.). **Bekämpfung von Mehltau und Rost an Chrysanthemen.** [Control of Chrysanthemum mildew and rust.] —*Blumen- u. PflBau ver. Gartenwelt*, xl, 17, pp. 202–203, 1936.

Replying to an inquiry as to the best means of combating chrysanthemum mildew (*Oidium chrysanthemi*) and rust (*Puccinia chrysanthemi*) [*R.A.M.*, xii, pp. 642, 677; xv, p. 78], H. Pape recommends (in addition to cultural measures) spraying with sulphur-containing preparations, e.g. cosan [ibid., xi, p. 682], erysit [ibid., x, p. 461], vomasol S [ibid., xii, p. 380], and solbar, or dusting with finely ground or ventilated sulphur, approved brands of which include antiperoid, Novezza, Ventilato-prima, extra-ventilated (hochventiliert) sulphur Sternmarke KCo, Ventilato Imperal, and Ventilato. The treatments should be given fortnightly or oftener and are most effective in warm, sunny weather.

Sulphur-containing preparations, including kolloisan and thiocol, are also advised by M. Marggraf for the control of *O. chrysanthemi*, but rust should be treated by the application at two- to three-weekly intervals of 1 per cent. ordinary or Wacker's Bordeaux mixture [ibid., xv, p. 539], followed, four weeks before cutting, by an application of 1 per cent. Burgundy mixture.

GAUDINEAU (Mlle M.). **Le flétrissement des Reines-Marguerites dû au Fusarium callistephi.** [Wilt of China Asters due to *Fusarium callistephi*.]—*Rev. Path. vég.*, xxiii, 2, pp. 123–130, 1 fig., 1936.

Since 1931, China asters [*Callistephus chinensis*] growing in widely separated localities in France have been seriously infected by *Fusarium conglutinans* var. *callistephi* [*R.A.M.*, xiii, p. 516], the symptoms caused by which are briefly described. The disease appears generally about the beginning of July and is favoured by a temperature about 22° [C.] and to a lesser degree by soil moisture, excess of nitrogen, and lack of lime. Seed treatment for 20 minutes with commercial formalin (2·5 per mille)

resulted in marked reduction in infection except when the weather conditions strongly favoured the fungus, in which case soil disinfection of the seed-beds with 1 to 2 per cent. formalin at the rate of 25 l. per sq. m. also became necessary. Trials at Versailles showed that a variety of American origin, Los Angeles (not the same as Super Giant Los Angeles), was completely resistant, while the following French varieties were strongly resistant: Victoria géante (crimson), Comète géante (dark violet, also white), and Victoria imbriquée (dark blue).

FRON (G.). **La maladie de la fusariose des Oeillets.** [Fusariosis disease of Carnations.]—*Rev. Path. vég.*, xxiii, 2, pp. 131–144, 3 figs., 1936.

In 1932 heavy losses were sustained by carnation growers in different parts of France as a result of the wilt disease caused by *Fusarium dianthi* [*R.A.M.*, xiii, p. 31; xv, p. 225], a species referred by Wollenweber to *F. conglutinans* var. *major* [but maintained as a distinct species in Wollenweber's and Reinking's recent monograph: ibid., xiv, p. 708]. Apparently vigorous plants would develop a young shoot which changed colour and dried up, desiccation progressing rapidly; simultaneously at the collar lesions were formed in which the tissues were destroyed to a considerable depth, and the plant snapped off at this level at the least touch. The fungus was readily isolated from diseased plants.

From the results obtained in preliminary experiments on control the author recommends that cuttings should be made as far as possible from healthy plants only, and steeped for 12 to 18 hours in a 1 in 20,000 solution of neutral orthooxyquinoline sulphate, after which they should be potted and given the usual fungicidal treatment with the same solution. After the plants have been transferred to the glasshouse further spray applications should be made at concentrations ranging from 1 in 20,000 to 1 in 50,000. Diseased plants should be burnt. This method resulted in a loss of only 3 to 5 per cent. in most varieties, while susceptible varieties such as Page showed only 25 to 30 per cent. loss; on the Alsace variety losses of 60 to 80 per cent. were reduced to 15 to 20 per cent. The treatment was also effective in preventing the germination of spores of *Puccinia dianthi*.

LINDEGG (GIOVANNA). **Il seccume e il marciume fogliare del Pelargonio.** [Wilt and leaf rot of *Pelargonium*.]—*Riv. Pat. veg.*, xxvi, 1–2, pp. 1–9, 2 figs., 1936.

The author gives an expanded account of the disease of *Pelargonium zonale* caused by *Macrosporium macalpineanum* which was recently reported by Ferraris [*R.A.M.*, xv, p. 442]. In the early stages of infection only two or three isolated spots are present on each leaf; they are round to oval, 0·5 to 1 cm. in diameter, brown, zonate, with a dark reddish, raised rim, later drying up and acquiring a papery consistency. On the lesions are found conidiophores of the fungus, 100 to 120 by 3 to 4 μ, each bearing a single conidium, with 2 to 8 transverse septa and occasional longitudinal ones, 50 to 20 μ when mature with a peduncle [beak] 10 μ in length. The severity of the infection, which caused an abundant leaf fall, is attributed to humid weather.

Jurišić (J.). **Neue Pilze aus Jugoslawien.** [New fungi from Jugo-Slavia.]—*Ann. mycol., Berl.*, xxxiv, 1–2, pp. 57–58, 1936.

Latin diagnoses are given of three new species of fungi collected in Jugo-Slavia and described (in unpublished correspondence) by Dr. F. Bubák of Prague in 1923. *Aecidium banaticum* Bubák, found causing a yellow discoloration of *Viola tricolor* leaves and sepals in sandy soil at Deliblato, Banat, is characterized by hypo-, more rarely epiphyllous, cupuliform aecidia with reflex, lacerated margins. The variably shaped, indistinctly seriate pseudoperidial cells increase in thickness towards the interior and measure 20 to 35 by 16 to 22 μ. The globose to oblong, polyhedral, thin-walled, finely verrucose, hyaline spores with yellow contents measure 18 to 27 by 18 to 22 μ.

Van Gennep (V. C.). **De symptomen van physiologische ziekten van Lupinus luteus L.** [The symptoms of physiological diseases of *Lupinus luteus* L.]—Thesis, Univ. of Utrecht, x+107 pp., 6 pl., 6 figs., 4 graphs, 1936. [English summary.]

An exhaustive account is given of the writer's laboratory experiments to determine the effect on yellow lupins (*Lupinus luteus*) of deficiencies of the essential elements, phosphorus, potassium, magnesium, nitrogen, boron, manganese, copper, calcium, and iron [*R.A.M.*, xv, p. 298]. Shortage of the last-named rapidly induced severe chlorosis and withering, accompanied by stunting or abnormal elongation of the roots. It was experimentally shown that iron deficiency is responsible for lime-induced chlorosis.

A ten-page bibliography is appended and a brief survey of the relevant literature precedes the sections on the various elements used in the investigations.

Lindenbein (W.). **Zytologische und histologische Untersuchung der auf den Blättern von Kalimangelpflanzen bei Gramineen und Inkarnatklee auftretenden Weissfleckigkeit.** [A cytological and histological study of the white spotting occurring on the leaves of Graminaceous and crimson Clover plants deprived of potash.]—*Ernähr. Pfl.*, xxxii, 8, pp. 144–150, 6 figs., 1936. [English and Spanish summaries on p. 160.]

The white spotting of the leaves of potash-deficient *Dactylis glomerata*, *Phalaris arundinacea*, *Festuca pratensis*, and crimson clover (*Trifolium incarnatum*) observed by Lowig in connexion with his mildew [*Erysiphe graminis* and *E. polygoni*] experiments at Bonn University [*R.A.M.*, xiv, p. 571] is fully discussed from the cytological, histological, and anatomical standpoints.

The disturbance is not identical with Sorauer's 'spot necrosis' (*Ber. dtsch. bot. Ges.*, xxi, p. 526, 1903; *Landw. Jb.*, xxxiii, p. 585, 1904), which mostly occurs as a brown spotting in the normal course of the growing period of the leaf. It is also not merely a consequence of defective chlorophyll formation but rather a symptom of cytological degeneration (using 'cytological' in Küster's sense of a genuine pathological breakdown of the cell involving the membranes and ultimately leading to histolysis of the type induced by adverse nutritional factors, such as potash deficiency).

Richter (H.). **Fusskrankheit und Wurzelfäule der Lupine. (Erreger: Rhizoctonia solani K.).** [Foot disease and root rot of the Lupin. (Agent: *Rhizoctonia solani* K.).]—*Zbl. Bakt.*, Abt. 2, xciv, 5–8, pp. 127–133, 3 figs., 2 graphs, 1936.

Lupins (*Lupinus angustifolius*, *L. luteus*, and *L. albus*) in Germany are stated to suffer from a foot and root rot, associated with stunting, wilting, premature defoliation, and shrivelling of the pods, the causal organism of which was identified as *Rhizoctonia* [*Corticium*] *solani* [cf. *R.A.M.*, xii, p. 96; xv, p. 510]. Comparative studies of *C. solani* from lupins, potatoes, and conifer seedlings and of the organism usually referred to *Moniliopsis aderholdi* from *Cereus* and vine revealed no essential differences and it is concluded that the latter is not entitled to specific but at most to varietal rank [ibid., xiv, p. 278].

Cross-inoculation experiments were carried out on lupins and potatoes (Aal, Erdgold, and Maibutter varieties) with nine different strains of the fungus, of which only one of the four from lupins infected potatoes, while the two most virulent on potatoes (from potato and *Cereus*) were only slightly pathogenic to lupins. The latter host was further attacked severely by one of the two vine strains, while the other and that from conifers caused milder symptoms. Both in pathogenicity relations and in rapidity of mycelial growth the potato and *Cereus* strains showed marked similarities.

Weimer (J. L.) & Madson (B. A.). **Relative resistance to bacterial wilt of certain commercial and selected lots of Alfalfa.**—*J. agric. Res.*, lii, 7, pp. 547–555, 1936.

A tabulated account is given of experiments, started in 1930, at Delhi and Davis, California, in which lucerne plants obtained from 59 lots of seed from various sources were inoculated twice with *Phytomonas insidiosa* [*Aplanobacter insidiosum*: see above, p. 559] and were grown in field plots for six months or one year after each inoculation. Seed was obtained from the plants that remained healthy and the progeny of this seed was tested for resistance to the wilt. The results again confirmed the findings of previous investigators, in that they showed that Turkestan, Hardistan, and Ladak lucerne lots contain the highest percentages of resistant individuals; a few plants from some other seed lots also survived the two inoculations and their progenies are now being tested. The fact that three lots of Iran (Persia) lucerne contained more resistant individuals than most of the others raises the question as to whether these lots did not come originally from Turkestan, since most of the Iran lots have hitherto shown relatively low resistance. There was clear evidence that resistance is transmitted to the progeny in varying degrees by different individual plants.

Kheswalla (K. F.). **Fruit diseases in Baluchistan.**—*Agric. Live-Stk India*, vi, 2, pp. 204–215, 6 pl. (2 col.), 1936.

Notes are given on the fruit diseases observed by the writer in Baluchistan in 1932 and 1933. Heavy damage is stated to be caused by the blister disease of apples (*Coniothecium chomatosporum*) [*R.A.M.*, xiv, p. 617], which also affects plums in a mild form. Control may be

secured by two applications of lime-sulphur at summer strength. Apples are further liable to infection by *Penicillium expansum* [ibid., xiv, p. 286], *Trichothecium roseum* [ibid., xiii, pp. 35, 108; xiv, p. 40], *Alternaria* rot, Jonathan spot [ibid., xv, p. 300], leaf scorch [ibid., x, p. 43] (also affecting apricots and walnuts), *Cytospora* stem canker [ibid., xi, p. 186], and mildew (*Oidium* sp.).

Pear trees at the Quetta Fruit Experiment Station suffer considerable damage from a die-back, due possibly to the action of the sun's rays and dry winds on the tender tissues.

Peaches are liable to infection by leaf curl (*Taphrina deformans*) and scab (*Cladosporium carpophilum*). Splitting is a common defect of physiological origin in peaches, and a species of *Rhizopus* frequently gains access to the affected kernels. Gummosis (non-parasitic) occurs in heavy, poorly-drained, over-manured soils [cf. ibid., xii, p. 575 *et passim*]. Certain trees have shown the leaf but not the fruit symptoms associated with peach yellows [ibid., xv, p. 516], and prompt removal of suspected cases is recommended. A species of *Alternaria* produces on peach leaves light brown, circular lesions, up to 3 mm. in diameter, surrounded by darker rings. Irregular, dark brown spots are formed on the foliage by a species of *Coniothecium*; the diseased tissues may fall out, giving a shot-hole appearance to the leaves.

Almonds, apricots, and peaches are subject to infection (mostly foliar) by *Phyllosticta prunicola* [ibid., x, p. 296], which overwinters on fallen leaves. Associated with a species of *Alternaria* causing a dark brown, irregular spotting of almond leaves is a *Coniothecium* closely resembling that mentioned above as infecting peach foliage. *Oidiopsis taurica* [see above, p. 554] was observed on one or two almond trees. A species of *Cytospora* occurred on the chalk-white limbs of almonds and another strain caused a die-back of walnut [ibid., xii, p. 270].

Severe damage may be caused in vineyards by powdery mildew (*Uncinula necator*) [ibid., xi, p. 622] in the absence of proper precautions against the disease; epidemics are liable to occur when dry conditions follow a brief rainy spell. In Baluchistan the mildew appears to be restricted to the fruits and only the *Oidium* stage has been observed. Vine leaves are attacked by a species of *Clasterosporium* with dark brown, uni- to biseptate conidia, which forms on the under sides dark, velvety, irregular lesions, 1 to 8 mm. in diameter. A malodorous rot of watermelon is caused by *Pythium aphanidermatum* [ibid., xiv, p. 7]. A brownish to black discoloration of pomegranate seeds, the central cavities of which are filled with spores, is caused by *Aspergillus castaneus* Patt.; infection may occur either through insect punctures in the rind or at the calyx end.

The paper terminates with some brief general recommendations for the control of fruit diseases by cultural measures and spraying.

PITTMAN (H. A. J.). **'Black spot' or 'scab' of Apples.**—*J. Dep. Agric. W. Aust.*, 2nd Ser., xiii, 1, pp. 20–29, 5 figs., 1936.

In 1936, apple scab (*Venturia inaequalis*) caused exceptionally serious losses in eastern Australia, the prevailing weather having been particularly favourable to infection. The disease was first officially recorded in Western Australia in 1930 [*R.A.M.*, ix, p. 792], and the outbreaks

were successfully controlled. No further infections occurred in Western Australia until 5th February, 1936, when a new outbreak was found near the site of the first attack. A number of Yates and Cleopatra trees near the centre of the orchard were rather seriously affected, several Granny Smith trees and one Winter Pearmain being very slightly infected. Altogether, forty or fifty apple trees over an area of about $1\frac{1}{2}$ acres were affected. Infection had spread from a very badly diseased tree in the direction of the two prevailing winds; no infection was present in any neighbouring orchard or in that where the 1930 outbreak had occurred. The methods used in combating the outbreak are described, and the paper concludes with notes on the economic importance of eradication in Western Australia, the geographical distribution of the disease, symptoms, life-history, and control.

In a footnote a further outbreak of the disease is recorded, almost entirely restricted to a few rows of Cleopatra trees.

WEBER (ANNA). **Aeble og Paereskurv. En af Frugtavlernes værste Fjender.** [Apple and Pear scab. One of the fruit-grower's worst enemies.]—Suppl. to *Producenten*, 16, 14 pp., 9 figs., 1936.

Popular notes are given on the symptoms, mode of infection, and control of apple and pear scab [*Venturia inaequalis* and *V. pirina*] in Denmark [*R.A.M.*, v, p. 559; ix, p. 113], with notes on varietal susceptibility, liability to spray injury, and other points of interest.

OSTERWALDER (A.). **Schorfbekämpfungsfragen.** [Scab control problems.]—*Schweiz. Z. Obst- u. Weinb.*, xlv, 7, pp. 115–118; 8, pp. 136–139, 1936.

Sulfomaag (a highly concentrated Bordeaux mixture supplied by Chem. Fabr. R. Maag, Dielsdorf) was experimentally shown to be fully equal at a strength of 1 per cent. to the ordinary Bordeaux at 2 per cent. in the control of apple scab [*Venturia inaequalis*] and is accordingly recommended for this purpose on grounds of economy. It was equally effective with cupromaag [*R.A.M.*, xv, p. 1] for late (mid-August) applications on the Boiken variety, which tends strongly to the belated development of infection. The results obtained with Bordo-Xex (Chem. Fabr. 'Flora', Dübendorf) in tests against apple, pear [*V. pirina*], and cherry [*V. cerasi*] scab were conflicting. Little advantage was derived in 1935 from two pre-blossom treatments of apples with Bordeaux mixture as compared with one.

MOORE (M. H.). **Some observations on the influence of manurial dressings and of certain other factors on the incidence of scab (Venturia inaequalis (Cooke) Wint.) and of spray-injury in Apples.**—*J. Pomol.*, xiv, 1, pp. 77–96, 2 figs., 1936.

The data obtained from observations made incidentally to pomological studies in an orchard of Bramley's Seedling and Worcester Pearmain apple trees indicated that the degree of fruit infection by *Venturia inaequalis* was governed by the manurial treatment given, grassing-down, seasonal conditions, and the rootstocks on which the trees were worked [*R.A.M.*, x, pp. 37, 192, 466; xiv, pp. 317, 590]. In general, nitrogenous manuring increased the tendency to scab, while grassing-

down decreased it. Rootstock influence showed differential reactions to these stimuli, and weather conditions provided a further source of variation in response. On the leaves the disease was also influenced by rootstock and manurial treatment. Other factors omitted, the fruit of both varieties was more susceptible to scab on trees worked on rootstocks Nos. III, IV, VII, or X, than on those worked on Nos. I, II, V, or VI; the reaction of Cox's Orange Pippin on these rootstocks was, however, mostly different. In 1934, fruit russeting on Bramley's Seedling caused by a petal-fall application of Bordeaux mixture was rather more severe on trees receiving only nitrogen than on those receiving potash, nitrogen with potash, or no manure. The trees on rootstocks Nos. I, IV, and V showed more russeting than those on Nos. II, III, VI, VII, and X.

Clear evidence was obtained that the relationship between scab incidence and manurial treatment is not a simple issue, governing factors of primary importance being the scion variety, the rootstock, and the weather conditions. Soil conditions are also probably an important factor. These variables exert their several influences one upon another, so that the ultimate reaction on the tree and therefore to the disease is of very complex origin.

ARK (P. A.) & THOMAS (H. E.). **Persistence of Erwinia amylovora in certain insects.**—*Phytopathology*, xxvi, 4, pp. 375–381, 1936.

The internal organs of *Drosophila melanogaster* and *Musca domestica* larvae fed on apple medium contaminated by *Erwinia amylovora* [*Bacillus amylovorus*: *R.A.M.*, xv, p. 515] were found to contain the organism, which persisted through the pupal to the adult stage in both insects. Eggs of *M. domestica* from contaminated females carried the organism externally but not internally, while it was internally harboured for six, three, and four days, respectively, by adults of *D. melanogaster*, *M. domestica*, and *Lucilia sericata*. The bacteria remained viable in the viscera of honey-bees (*Apis mellifica*) for 48 hours but were not recovered from the heads after 12 hours from the time of inoculation [ibid., xiv, p. 370].

BARTHELET (J.). **Recherches expérimentales sur les traitements des tavelures des arbres fruitiers et du mildiou de la Vigne.** [Experimental researches on treatments against fruit tree scabs and Vine mildew.]—*Ann. Epiphyt.*, N.S., i, pp. 103–119, 2 pl., 1936.

Experiments carried out from 1933 to 1935 inclusive at Versailles showed that the most efficacious spring application of Bordeaux mixture against pear scab (*Venturia pirina*) [*R.A.M.*, xv, p. 234 and next abstract] was the second one, given after flowering, in 1933, the first one, before flowering, in 1934, and the third one, after flowering, in 1935. When the dates of these applications are correlated with the dates of the first outbreaks each year and the meteorological conditions prevailing it becomes apparent that, as regards the Paris region, no particular date for spring treatment against *V. pirina* can be recommended. Spray applications should be made before and after flowering and again a fortnight later. The same remarks apply to apple scab (*V. inaequalis*). When rain prevails at the end of summer one or two supplementary treatments are necessary.

Experimental evidence confirmed the view that in the vicinity of Paris five applications of Bordeaux mixture made on 15th June, 15th July, 1st and 15th August, and 1st September are sufficient to ensure complete protection of grapes against *Plasmopara viticola.*

Comparative tests of numerous fungicides employed against these diseases showed that 2 per cent. Bordeaux mixture was the most efficacious against *V. pirina* and *P. viticola* and 1 per cent. against *V. inaequalis.* The addition of alum and sulphate of ammonia [ibid., xiv, p. 814] in no instance increased and occasionally reduced the effectiveness of Bordeaux mixture. Copper hyposulphite 5 per 1,000 was efficacious against *P. viticola* in the one test made with it. Copper fluosilicate (0·5 per 1,000) caused serious scorching of vine foliage, while at half this strength it was no longer efficacious, though still producing some scorching.

MOREAU (L.) & VINET (E.). **De l'amélioration et de la défense de la production fruitière.** [On the improvement and defence of fruit production.]—*Ann. Epiphyt.*, N.S., i, pp. 257–275, 1936.

Spraying tests carried out on William pears at Angers in 1935 showed that the best combined treatment against *Carpocapsa pomonella* and *Venturia pirina* [see preceding abstract] was a cupro-arsenical mixture consisting of 1 kg. copper sulphate, 3 kg. sifted lime containing 64 per cent. of free lime, and 1 kg. diplumbic lead arsenate per 100 l. This mixture gave practically complete control, following six applications on 8th and 24th April, 16th May, 3rd June, and 11th and 23rd July.

FIKRY (A.). **Water-table effects. II. Relative incidence of diseases on stone-fruit trees.**—*Bull. Minist. Agric. Egypt* 154, 52 pp., 43 pl., 23 graphs, 1936.

Continuing his earlier investigations [*R.A.M.*, xiv, p. 177], the author made a detailed study of the effect of varying heights of the sub-soil water-table on the physiological gumming disease that affects plums, peaches, and apricots in Egypt, as well as on shot hole (*Clasterosporium carpophilum*) and rust (*Puccinia pruni-spinosae*) [ibid., xv, p. 236] of the same hosts and peach mildew (*Sphaerotheca persica*) [*S. pannosa*]. The experiments, which lasted from 1931 to 1934, inclusive, were carried out on a piece of land at the Nile Delta Barrage naturally divided into low, medium, and high terraces, the difference in soil-level between the low and high plots being about 100 cm. The plum varieties used were Wickson, Bokra, and Japanese Gold worked on Mariana (resistant) and Myrobolan (susceptible) rootstocks; the peaches and apricots were Beladi varieties raised from seed.

Monthly examinations were made, and the results obtained [which are tabulated] may be briefly summarized as follows. A high sub-soil water-table rendered the trees subject to fatal gumming and severe infection by the three other diseases. Growth and yield were better on the high terrace than the low one. Attack by all four diseases was severe during and immediately after the inundation period, i.e. from August to December, and decreased from January to July, though that of mildew, which occurred only on peaches, was also severe in June and July. The incidence of *S. pannosa* was very heavy in the low terrace

and very slight in the high one, but it appeared when water-table and air humidity was lowest. Susceptible plum varieties showed slight resistance to gumming on the high terrace and resistant plums slight susceptibility on the low one. The exceptionally high Nile flood of 1934 was detrimental to stone fruit trees in low-lying lands and some other districts, the trees wilting or shedding their leaves and finally dying. All the peaches and apricots in the low terrace and about half those in the middle one were dead by September or October, though not one tree was killed on the high terrace. The plums were also more severely affected in the two lower terraces than in the top one.

It is concluded that the water-table effect is greater than that of all other factors on the incidence and development of the diseases studied. The effect on rust and shot hole is direct and immediate, on gumming is less direct and more fundamental, and on peach mildew is quite abnormal.

SAREJANNI (J. A.). **L'apoplexie des arbres fruitiers des environs d'Athènes.** [Apoplexy of fruit trees in the vicinity of Athens.]—*Ann. Inst. phytopath. Benaki, Greece*, i, 3, pp. 45–50, 1935. [Received July, 1936.]

A large number of fruit trees, especially cherries, apricots, and peaches growing in the vicinity of Athens, are killed off each year during the period May to August as a result of attack by apoplexy [*R.A.M.*, xiv, p. 215]. In four years' investigations into the disease *Verticillium albo-atrum* was isolated from the trunks of 5- to 7-year-old affected apricots only. *Phytophthora cactorum* [cf. ibid., x, p. 214] was associated with the condition in apricot seedlings and 5- to 7-year-old trees showing lesions at the collar. Tumours resembling those caused by *Bacterium tumefaciens* were noted on cherry and almond trees that had succumbed, in practically all cases the presence of the bacterium being associated with attack by *Capnodis tenebrionis*. The author considers that the term apoplexy is commonly applied to various diseases due to a number of different factors.

SAREJANNI (J. A.). **Sur le Sclerotinia de l'Amandier.** [On the Almond *Sclerotinia*.]—*Ann. Inst. phytopath. Benaki, Greece*, i, 3, pp. 57–60, 1935. [Received July, 1936.]

In the Cretan almond orchards *Sclerotinia cinerea* [*S. laxa*] sometimes reduces the crop by nine-tenths. Infection falls into three stages. The first takes place mainly through the flowers, whence the fungus progresses to the peduncle and to the adjacent young branch. In the second stage the fruits become atrophied, and in the third the current year's branches are attacked. The last stage occurs at the end of April or early in May, when warm weather arrests further progress. Preliminary experiments showed that fungicidal treatment is of no value unless preceded by severe pruning and careful orchard sanitation, including the removal of all cankers and mummified almonds.

RUDOLPH (B. A.). **Brown rot of stone fruits on the Pacific coast and its control.**—*Bett. Fruit*, xxx, 10, pp. 3–5, 2 figs., 1936.

The losses to growers of stone fruits on the Pacific coast from brown

rot [*Sclerotinia fructicola*: *R.A.M.*, xiii, p. 33; xv, p. 304], which causes a blossom blight and ripe fruit rot, are stated to exceed those from all other diseases put together. Orchard sanitation is of cardinal importance in control, and should include ploughing in of the mummified fruits on the ground before the blossoms open to prevent infection of the blossoms. Apricots and peaches should be sprayed with Bordeaux mixture (5–5–50 or 6–6–50, or, in very damp regions 8–8–50) when the fruit buds are cracking and prunes and cherries when the winter buds have released the cluster buds and the latter have burst. As a rule, one thorough spray application suffices to give practical control. Alternatively prunes, plums, peaches, and cherries should be sprayed with wettable bentonite sulphur [ibid., xv, p. 484] or flotation sulphur [ibid., xv, p. 514], or dusted with these materials whenever infection appears. Applications immediately before picking are inadvisable, particularly for canning fruit, as the presence of much sulphur causes the cans to darken inside, but an application should always be given three or four weeks before gathering, whether the disease is present or not.

MAGEE (C. J.). **Bunchy top disease of Bananas. Rehabilitation of the Banana industry in New South Wales.**—*J. Aust. Inst. agric. Sci.*, ii, 1, pp. 13–16, 1936.

In this account of the successful war waged against banana bunchy top in New South Wales [*R.A.M.*, xiii, p. 642] it is stated that the disease was probably introduced in 1913 on material from Fiji. By 1922 there were some 5,500 acres planted to bananas in New South Wales, and the disease was then a serious menace. Unsuccessful attempts were made to check spread by the introduction of buffer zones, but by 1925 the area under bananas had fallen to 1,500 acres and production had decreased from 649,500 bushels (1922) to 90,000 bushels. At least 90 per cent. of the land under bananas in 1922 ceased production.

In 1924–5 an investigation of the disease showed that it was due to a virus disseminated from infected suckers by *Pentalonia nigronervosa*. Control measures involving the registration of plantations, eradication of diseased plants, and controlled replanting were drawn up and in 1927 regulations were gazetted proclaiming quarantine areas and governing the movement of suckers, &c. As a result, the acreage under bananas has increased from 1,992 acres in 1928 to 20,133 acres in 1935, the respective figures for production being 112,054 and 1,500,000 bushels. No serious outbreaks occurred until 1935, when the disease again became well entrenched in a few limited areas; so far, the industry has not become again imperilled, but the outbreaks show the necessity for continued vigilance.

WARDLAW (C. W.) & LEONARD (E. R.). **The storage of West Indian Mangoes.**—*Mem. Low Temp. Res. Sta., Trin.*, 2, 47 pp., 12 graphs, 1936.

In this account of the behaviour of mango varieties in cold storage it is stated that a close relation exists between mango anthracnose (*Gloeosporium mangiferae*) [*R.A.M.*, xiv, p. 518] and the physiology of ripening. The disease sometimes occurs as a destructive blight on the flowers and setting fruits, and later on the fungus appears in apparently

healthy adult fruits ripening on the tree or in storage. The evidence obtained showed that such infections have been latent for some time.

If mangoes are picked within a few days of eating-ripeness, after two or three days the fruit softens and latent *G. mangiferae* infections appear as numerous small spots, probably following a transition from aerobic to anaerobic respiration. It is not until later that the common storage saprophytes become active agents in fruit rotting. The outstanding types of wastage are *Dothiorella* stem-end rot [cf. ibid., xv, p. 238] and lateral decay (the major cause of wastage in Trinidad fruit) in the form of profuse anthracnose spotting [cf. ibid., xi, p. 793; xii, p. 521]. A *Phomopsis* and *Pestalozzia funerea* [ibid., xiv, p. 608] were occasionally isolated from lateral blemishes.

Most mango varieties (if the fruit is picked when full-grown green or rather more mature) show plain chill effects at 40° and 45° F. after 5 to 20 days. An abnormally early appearance of anthracnose spots is also a sign of chill injury. Fruit held at 50° for over 15 to 20 days was severely attacked and a storage temperature of 48° is tentatively suggested.

The data obtained indicate that Trinidad mangoes are considerably more subject to disease at the end of the fruiting season than at other times, and it seems unlikely that the total commercial wastage can be curtailed to the 10 per cent. allowed for other fruits. The high incidence of field infections shows that the whole question of orchard sanitation needs to be carefully considered.

SIMMONDS (J. H.). **Passion Vine diseases.**—*Qd agric. J.*, xlv, 4, pp. 322–330, 8 figs., 1936.

Popular notes are given on the following diseases of passion fruit [*Passiflora edulis*] and their control in Queensland: brown spot (*Alternaria* sp.) [previously referred to *Macrosporium* sp.; *R.A.M.*, xii, p. 41], also affecting granadilla (*P. quadrangularis*) and the white passion flower (*P. alba*); scab (a strain of *Cladosporium herbarum*) [ibid., xii, p. 40], restricted mainly to high altitudes; base rot, a trouble of obscure origin, believed to be due to the penetration of the plants through wounds by a soil organism; and woodiness [ibid., x, p. 394; xiii, p. 44], which has assumed serious proportions in the State since 1931 and must now be accounted the most important disease of the crop. The virus responsible for the condition is almost certainly transmitted from infected to healthy vines by certain sucking insects as well as by means of the sap adhering to the hands or to pruning knives.

ARTEMIEFF (G. V.). Грибные болезни Фейхоа. [Fungal diseases of *Feijoa*.]—*Советские Субтропики* [*Sovetsk. Subtrop.*], *1935*, 7, pp. 61–63, 5 figs., 1935. [Received June, 1936.]

An account is given of the author's investigation of the fungal diseases of *Feijoa sellowiana* in three Agricultural Experimental Stations in the neighbourhood of Sotchi [Caucasian littoral of the Black Sea] in view of the attempts that are being made to introduce the commercial cultivation of this fruit tree in that region. Besides a serious blossom blight caused by *Botrytis cinerea*, and two leaf spots of minor importance caused by *Pestalozzia versicolor* [*R.A.M.*, x, p. 247] and *P. gracilis*

Kleb., respectively, the studies showed the occurrence there of the following hitherto undescribed parasitic fungi, brief Russian descriptions of which are given [without Latin diagnoses]: *Phyllosticta feijoicola* n.sp. causes, on young seedlings, a severe grey, angular leaf spotting, with subsequent dropping out of the affected tissues. The pycnidia are epiphyllous, at first submerged and later erumpent, globose, sparse, and 80 to 120 μ in diameter; the pycnospores are hyaline, oblong-ellipsoidal, and 6·5 to 7·5 by 2·5 μ. This species is believed to be the imperfect stage of *Leptosphaeria feijoae* n.sp., which also occurs on the tree in nature, and is characterized by globose, hypophyllous, isolated or aggregated, submerged perithecia, 100 μ in diameter. The asci are cylindrical, sometimes slightly bent, 35 to 40 by 7 to 7·5 μ, and surrounded by a few paraphyses. The ascospores (eight) are olive-coloured, spindle-shaped, pointed at both ends, 3- to 4-septate, and 14 to 15 by 2·5 to 3 μ. *P. feijoae* n.sp., causing a grey, circular leaf spot, has chiefly epiphyllous, at first subepidermal and later erumpent, pycnidia 80 to 120 μ in diameter. The pycnospores are ellipsoidal, continuous, and 3·7 to 5·5 μ. The ascigerous stage of this fungus is apparently *Mycosphaerella feijoae* n.sp., with hypophyllous (rarely epiphyllous), crowded, globose, perithecia, 70 to 90 μ in diameter; the asci are cylindrical-clavate, rounded at the apex, slightly curved, with eight uniseptate, spindle-shaped, smooth, greenish ascospores measuring 10 by 3 μ. *Phoma feijoae* n.sp., the cause of a die-back of twigs, has flattened, oblong-oval, subepidermal and later erumpent pycnidia, 150 by 250 μ, and hyaline pycnospores measuring 3 to 5 by 1 μ. This list is admittedly not exhaustive.

De Ong (E. R.). **Improved wettable and dusting sulphurs.**—*Bett. Fruit*, xxx, 10, pp. 10–11, 3 figs., 1936.

The author describes the superiority of precipitated 'micro-sulphur', now made available by the gas industry in America, to sublimed or ground sulphur from the point of view of particle size (which in the former is often less than 1 μ), alkalinity, and free-flowing properties due to its normal content of inert substances which replace the fillers, such as magnesium carbonate, necessarily added to other sulphurs.

In field work a blend of 'micro-sulphur' with ground brimstone facilitates distribution and prevents drift, the finer particles adhering to the larger ones, and extends the control period to three weeks or more by preventing sublimation, which takes place within ten days at high temperatures in the case of extremely fine sulphur alone. Blends of this kind have proved especially valuable in the control of apple diseases, including scab [*Venturia inaequalis*] and mildew [*Podosphaera leucotricha*].

Martin (H.). **The scientific principles of plant protection.** Second edition.—xii+379 pp., London, Arnold & Co., 1936. Price 21*s*.

The second edition of this comprehensive survey of the scientific principles underlying methods of plant protection (which also aims at providing a book of reference upon insecticides and fungicides) differs little in plan from the first [*R.A.M.*, viii, p. 115], though the inclusion of new material has necessitated drastic revision of the text, the whole

work having been rewritten except for the introductory chapter. Ninety pages are devoted to fungicides, 17 to spreaders and stickers, and there are also chapters on seed and soil treatments. Every phase of the subject has developed in the eight years that have passed since the first edition appeared, particularly epidemiology, applications of synthetic chemistry, and the technique of assessing insecticidal and fungicidal efficiency in the laboratory, and the advances made are concisely incorporated in the new edition of this useful book.

GOLDSWORTHY (M. C.) & GREEN (E. L.). **Availability of the copper of Bordeaux mixture residues and its absorption by the conidia of Sclerotinia fructicola.**—*J. agric. Res.*, lii, 7, pp. 517–533, 1 fig., 1936.

This is a full report of the authors' investigations on the toxic action on the conidia of *Sclerotinia fructicola* of Bordeaux mixture deposits that have been exposed on glass slides to weathering and ageing under natural conditions in the orchard, an abstract from which has already been noticed from another source [*R.A.M.*, xiv, p. 381]. It is stated that conidia in which germination is delayed do not absorb copper, this process being correlated with the initiation of activity. When the quantity of copper in the residue is small, it may be exhausted by the conidia germinating first, the later ones escaping injury. The growth of conidia is inhibited by residues containing just sufficient copper to cause toxicity, but it is renewed when they are transferred to a suitable medium.

BOND (T. E. T.). **Disease relationships in grafted plants and chimaeras.** —*Biol. Rev.*, xi, 2, pp. 269–285, 1936.

A summary, supplemented by a three-page bibliography, is given of contemporary literature on the pathological relationships of grafted plants and chimaeras [cf. *R.A.M.*, xv, p. 522].

WILLIAMS (J. C.). **An hypothesis concerning bacteriophagy.**—*J. phys. Chem.*, xl, 4, pp. 477–478, 1936.

The hypothesis is advanced that bacteriophage may be a suspension of minute crystals of one or more of the compounds comprising the homologous bacteria, in which case bacteriophagy would represent the seeding of these amorphous compounds by the phage particle and their subsequent crystallization.

Evidence of the particulate nature of bacteriophage has been presented by various workers, and the size of the particles of different phages has been measured [*R.A.M.*, xv, p. 168]. The antigenic properties of phage indicate that it is a protein, a fact confirmed by Schlesinger's analysis (*Biochem. Z.*, cclxxiii, p. 306, 1934) of a phage in which 13 per cent. nitrogen was found. Proteins being hard to crystallize, spontaneous crystal formation would be expected to be rare and seeding highly specific, both of which conditions are in accord with the character of bacteriophage, a particular phage attacking only its homologous bacteria and closely related species.

When bacteria are attacked by phage a number of cells simply disappear, while others swell and finally burst, both these processes being

the logical outcome of the action of crystallization. Further support is lent to the crystallization theory by the sensitiveness of bacteriophage to protective substances and high viscosity. Thus, bacteriophagy was shown by Bronfenbrenner and Hetler (*Proc. Soc. exp. Biol. Med.*, xxx, p. 1308, 1933) to be inhibited by the presence in the medium of 4 to 5 per cent. agar, while Colvin (*J. infect. Dis.*, li, p. 527, 1932) and Evans (*Publ. Hlth Rep., Wash.*, xlviii, p. 411, 1933) demonstrated a similar effect in respect of serum, ascitic fluid, saliva, pus, and urine, and D'Hérelle (Le Bactériophage, Monogr. Inst. Pasteur, p. 95, 1921) reported inactivation with glycerol. A further indication of crystallization may be the granular appearance of bacteria subject to bacteriophagy. In conclusion, some possible objections to the crystallization hypothesis are briefly discussed, the implication being that improved methods of procedure would dispose of any apparent flaws in the theory.

YOUNG (H. E.). **A mycorrhiza-forming fungus of Pinus.**—*J. Aust. Inst. agric. Sci.*, ii, 1, pp. 32–34, 1936.

Boletus granulatus has been found in Queensland growing in association with *Pinus caribaea*, *P. taeda* [*R.A.M.*, xiii, p. 458], *P. patula*, *P. radiata*, *P. echinata*, and *P. longifolia*, the chief species of exotic pines planted in the State. The thick mycelial threads attached to the base of the stipe of the sporophores were occasionally traced to the coralloid ectendotrophic mycorrhiza on the roots. Isolations from the sporophores grew best on malt sucrose agar.

Seed of *P. caribaea*, *P. taeda*, and *P. patula* sterilized in mercuric chloride solution (1 in 1,000) and washed, was sown in autoclaved soil in glass-sided containers, the root systems being inoculated with a pure culture of *B. granulatus* when the seedlings averaged about 10 in. in height. Eight weeks later coralloid mycorrhiza enveloped the new root buds, the uninoculated controls showing no mycorrhizal development. The coralloid masses were initiated by the envelopment of a young root bud with a weft of hyphae, the bud then branching dichotomously, and each bud being in turn enveloped by the hyphae. The mycorrhiza averaged 2 mm. in length; for the first few weeks the hyphae are snow-white, later becoming light to dark brown. Sections showed the mycorrhiza to be ectendotrophic, with an external layer on the root cortex and an intercellular penetration of hyphae forming the characteristic Hartig net. Intracellular growth was rare. The layer of hyphae on the cortex was often half as thick as the latter; it enveloped the root tips when the root cells were much reduced in number.

When *P. caribaea* and *P. patula* seedlings in pots were inoculated with a culture of *B. granulatus* on sterilized oats vigorous growth resulted, the foliage becoming a healthy green, though control seedlings in uninoculated pots showed little or no growth, a purplish-red foliage, and finally died [cf. ibid., xv, p. 456].

NIGAM (B. S.). **Physiology of zonation — effect of light and temperature on zonation in Acrothecium lunatum Wakker.**—*J. Indian bot. Soc.*, xv, 2, pp. 115–123, 1 diag., 1936.

Two zones of growth were found to be produced every 24 hours in cultures on 2 per cent. rice agar of *Acrothecium lunatum* [*Curvularia*

lunata: *R.A.M.*, xv, p. 496] isolated from red spots on sorghum leaves at Cawnpore when exposed to alternations of light and darkness [cf. ibid., iv, p. 628], pink circles being formed during the day and white ones at night. Alternating zones are produced at a temperature range of 73° to 93° F. in daylight, but in continuous absolute darkness zonation is absent, as it is also inside the incubator, where the colonies, however, are aerial and of a dense bottle-green colour. Smoky colonies surrounded by a white ring of young growth are formed under the influence of electric light at 76° to 93°, and also under that of red light at the latter temperature, whereas in red light at 76° the colonies are deep pink, encircled by a white ring of new growth [cf. ibid., iv, p. 374].

LEONIAN (L. H.). **Control of sexual reproduction in Phytophthora cactorum.**—*Amer. J. Bot.*, xxiii, 3, pp. 188–190, 1936.

No growth is made by *Phytophthora cactorum* in a solution consisting of the essential salts and dextrose, but the addition to such a medium of 0·2 per cent. proteose peptone induces satisfactory development [cf. *R.A.M.*, xv, pp. 42, 109], a similar effect further resulting from the use of malt and yeast extracts, anticitrin, corpora lutea, ovarian substance, and other products tending to stimulate the reproductive mechanism. Growth-promoting substances [cf. ibid., xv, p. 309] do not necessarily induce sexual reproduction and a number of powerful sex hormones of animal origin failed to exert any influence on the fungus. No sexual organs were formed in a solution composed of the essential salts, glucose, and peptone, but a mycelial colony produced on the latter medium, washed, and transferred for an hour to pea infusion begins to form oogonia and antheridia, and continues to do so even after another washing, and removal to distilled water. Sexuality in *P. cactorum* is inhibited by the presence in the medium of 0·1 per cent. tartaric acid, 0·2 per cent. potassium carbonate, or 2 per cent. proteose peptone. Evidence was obtained that the fungus is unable to synthesize growth- and reproduction-promoting substances from the nutrient solution but must be supplied from an external source, such as the above-mentioned pea infusion.

BROWN (W.). **The physiology of host-parasite relations.**—*Bot. Rev.*, ii, 5, pp. 236–281, 1936.

The writer summarizes and discusses some outstanding contributions to the knowledge of the relationships between fungal parasites (facultative and obligate) and their hosts, with observations on the factors involved in the development of resistance or susceptibility, and a brief reference to the theory of acquired immunity, a critical review of the literature on which has been published by Chester [*R.A.M.*, xiii, p. 116; xv, p. 389]. Most of the recent papers cited in the bibliography of 149 titles appended to the present article have been noticed in this *Review*.

CRÉPIN (C.). **Quelques réflexions à propos de la Pomme de terre.** [Some observations in connexion with the Potato.]—*C.R. Acad. Agric. Fr.*, xxii, 11, pp. 437–440, 1936.

In this paper (preceded by an introductory note on pp. 436–437 by [E.] Schribaux), the writer sums up the knowledge at present available

on potato degeneration [see next abstracts], which he attributes to the action of transmissible, hereditary, and incurable virus diseases, such as leaf roll, mosaic, and streak [*R.A.M.*, xv, p. 247]. Plants cultivated under conditions permitting the total exclusion of the aphid vectors of virus diseases remain healthy and produce sound progeny. Selection (involving the timely roguing of diseased individuals in a stand) is stated to be an unfailing remedy against virus degeneration, but it is more easily practised in regions relatively free from aphid infestation (e.g., in the maritime climates of Holland, Scandinavia, Brittany, and in mountainous districts) than in the hot, dry plains. It must be emphasized, however, that although selection is comparatively simple in the mountains, diseased plants do not actually recover on transference to the heights, and the so-called 'altitude cure' is entirely illusory [ibid., xv, p. 523]. The procurement of selected seed, which is legally defined as consisting of tubers from stands subjected to systematic roguing, is of great importance, for the maximum yields are obtained from healthy plants cultivated under optimal environmental conditions.

PRIEN. **Ist eine Bekämpfung des Kartoffel-Abbaues möglich?** [Is a campaign against Potato degeneration practicable?]—*Dtsch. landw. Pr.*, lxiii, 5, p. 57, 1936.

Potato degeneration, which the writer attributes primarily to virus infection [*R.A.M.*, xv, p. 391], is stated to be controllable only by indirect measures, including the procurement of seed (5 per cent. of the total requirement being renewed annually) from healthy ('non-degenerating') districts; the use of relatively resistant varieties; cultivation of the crop alternately on different soil types, e.g., mineral and bog soils; the provision of optimal growth conditions by cultural practices; and the raising of healthy stands for propagation by the use of eyes only, so as to preclude the transmission of degenerate tendencies through the flesh and skin [see next abstract]. To this end the eyes are excised with as little adhering flesh as possible and planted out at the end of April or early May at intervals of 20 to 25 cm. in shallow furrows 30 to 40 cm. apart. The seedlings thus obtained are stated to be remarkably healthy and to produce almost as many seed tubers as those from whole potatoes, while the total yield is about half the normal.

BERKNER [F.]. **Zur Frage des Kartoffel-Abbaues. Ist es möglich, die Neigung zum Kartoffel-Abbau hinauszuschieben?** [On the question of Potato degeneration. Is it possible to postpone the tendency to Potato degeneration?]—*Dtsch. landw. Pr.*, lxiii, 14, p. 167, 1936.

Commenting on Prien's method of preventing potato degeneration by the use of 'eyes' from healthy tubers [see preceding abstract], the writer confirms the validity of this technique from his own experience. He then briefly describes his own practice of pregermination, whereby it is stated to be easy under Silesian conditions to obtain two good harvests in one season, the first crop being planted out (after germinating in boxes in diffuse light) about the end of March to middle of April and lifted about 10th July, between which and 22nd July the second (medium late) may be planted. By this means the field is left free

during the latter part of the year for fodders, cabbage, late flax or hemp, and the like. From the second potato crops the yields during 1930–33 have averaged 121 dz. [12,100 kg.] per hect., while the progeny of such plantings remain free from degeneration and produce yields exceeding by 30 per cent. or more those of ordinary stands. It has been shown elsewhere [ibid., xv, p. 457] that the planting of the second crop before about 10th July is liable to induce severe symptoms of degeneration in the progeny.

Busse [G.]. **Zur Frage des Kartoffelabbaues.** [On the question of Potato degeneration.]—*Dtsch. landw. Pr.*, lxiii, 17, p. 207, 1936.

Some observations are made on the factors affecting potato degeneration [see preceding abstracts] in central Germany (Halle–Leipzig district). In general, it is not practicable to defer the planting of the early crop until May, so that this means of preventing degeneration is precluded. New seed, especially of late varieties, has to be procured almost every year, preferably from regions where the growing period is shorter. Varieties resistant to wart [*Synchytrium endobioticum*] are less liable to run out than other sorts, among which Erdgold and Industrie tend strongly to degenerate.

Wenk (H.). **Kartoffelzüchtungsfragen. I. Teil: Staudenauslese und Pflanzgutbau bei Kartoffeln.** [Potato breeding questions. Part I: Hill-selection method and seed production in Potatoes.]—*Prakt. Bl. Pflanzenb.*, xiv, 1, pp. 2–13, 4 figs., 1936.

The following observations are of interest in connexion with the control of potato diseases by breeding. Extensive experiments in the elimination of leaf roll by the hill-selection method gave unsatisfactory results from the control standpoint but yielded valuable information in other respects. It was noticed, for instance, that a sound progeny generally sprang from normally maturing plants, whereas plants remaining green beyond the term of natural discoloration produced unhealthy offspring. Such plants may be more than ordinarily prolific in the first season but tend to fall off rapidly in subsequent years.

Under the climatic conditions of Weihenstephan, Bavaria, the continuous production of healthy seed can be effected only by the use of fair-sized tubers closely planted on light soils. The Industrie and Wohltmann varieties appear to be the best suited among those tested for local cultivation, Pepo and Deodara degenerating rapidly even in the most favourable sites. A judicious manuring scheme is of great importance in the promotion of resistance to disease. Early applications of stable manure in moderate amounts and a green fertilizer are always appropriate, while phosphoric acid also appears to be serviceable. A storage temperature of 0° to 7° C., such as can be maintained in an underground cellar, has been found much more conducive to health than the relatively high ones prevailing in the rooms ordinarily available for this purpose.

The spread of virus diseases is thought to be largely dependent on environmental influences and other external factors, such as the annually fluctuating incidence of the aphid vectors. During the last few years the timely detection of virus symptoms has been greatly

simplified by the excision during January of eyes from the tubers which are rapidly germinated in the greenhouse and within six or eight weeks clearly show the symptoms—often masked in the field—of infectious mosaic and disturbances of the leaf-roll type.

It follows from the data here presented that a successful breeding scheme must be based, on the one hand, on the provision of favourable environmental conditions, and on the other, on the punctual extermination of all individuals suffering from infectious diseases. Some practical recommendations for the application of the principles herein laid down are given.

Schick (R.). & Lehmann (H.). **Zur physiologischen Spezialisierung von Phytophthora infestans de Bary. Zugleich ein Beitrag zur Methodik der Züchtung krautfäulewiderstandsfähiger Kartoffeln.** [On physiological specialization in *Phytophthora infestans* de Bary, simultaneously with a contribution to the technique of breeding Potatoes for blight resistance.]—*Züchter*, viii, 2, pp. 34–46, 1 fig., 2 diags., 1936.

A detailed account is given of the writers' experiments at the Müncheberg Plant Breeding Institute with four monosporangial lines of *Phytophthora infestans* [*R.A.M.*, xiv, p. 390 and next abstract] grown in pure culture on malt extract agar, potato tubers, and potato foliage. The 246 clones, representing the F_1, F_2, F_2', F_3', and F_4' progenies of crosses between *Solanum demissum* and potato, inoculated with the four lines (nos. 1 to 4, no. 2 being that designated by Müller as the S type), were divided into five groups on the basis of their reaction, viz., A (resistant to all lines), W (to 1, 3, and 4 only), K (to 1 and 2 only), M (to 1, 2, and 3 only), and Z (to none). The A group contained 82 clones; W (to which Müller's W races belong), 100 clones; K, 44; M, 6; and Z, 14. The importance of the different lines from the plant-breeding standpoint is discussed, stress being laid upon the fact that in this connexion geographical distribution is a minor consideration compared with pathogenicity towards the test assortment, which comprises clone 34,1567/20 (belonging to group A), Müller's Sämling 51 573 (W), clone 34,2109/2 (M), Knappes Sämling 87615 (K), and Parnassia (Z). The possibility of the origin and detection of further races of the fungus is also envisaged.

Schick (R.) & Schaper (P.). **Das Verhalten von verschiedenen Formen von Solanum demissum gegenüber 4 verschiedenen Linien der Phytophthora infestans.** [The reaction of various forms of *Solanum demissum* to 4 different lines of *Phytophthora infestans*.]—*Züchter*, viii, 3, pp. 65–70; 4, pp. 102–104, 1936.

Various forms of *Solanum demissum* were inoculated with four different lines of *Phytophthora infestans* [see preceding abstract], with the result that some manifested complete resistance, others extreme susceptibility, while others again reacted divergently to the various lines. In addition to forms homozygous for resistance there were many cases of segregation in reaction to the different lines of *P. infestans*. For further testing (in which strict attention must be paid to this segregating tendency) only the following forms of *S. demissum* are suitable: *utile*, *tlaxpehualcoense*, El Desierto, Reddick 525, 530, 531, 533, strains of *xitlense*, von Bukasow's form, and one from Rio Frio. There

is considered to be a possibility, however, of isolating absolutely resistant strains from later generations of the segregants.

It is apparent from the outcome of these tests that no general statement can be made regarding the resistance of *S. demissum* to *P. infestans*, any such observation being restricted to particular forms of the host and to certain strains of the fungus. Similar considerations are probably applicable to the various forms of *S. antipovichii*, *S. ajuscoense*, and *S. verrucosum*.

SELARIÈS (P.) & ROHMER (G.). **La maladie verruqueuse de la Pomme de terre en Alsace.** [Potato wart disease in Alsace.]—*Ann. Epiphyt.*, N.S., i, pp. 23–55, 26 figs., 1936.

After reviewing the progress of potato wart disease (*Synchytrium endobioticum*) in Alsace [*R.A.M.*, v, p. 446 *et passim*], and describing the life-history of the parasite, the author tabulates and discusses the results of varietal resistance tests carried out in a heavily infected plot since 1926. In general, foreign varieties showed the same resistance to wart disease as they were reported to do in their country of origin. The reputedly resistant Dutch Commandant variety showed infection in 1926, but remained healthy in each of the five following years, the Favoriet variety behaving somewhat similarly. Triumph potatoes were attacked in 1933, and the Polish variety Ursus in 1930. On both the last-named varieties laboratory inoculations produced characteristic galls. Certain tomato varieties and *Solanum dulcamara* also proved susceptible.

In laboratory infection tests varieties generally resistant in the field readily developed the disease, though in many instances scarcely any outward sign of infection was apparent. In microtome sections prosori and summer sporangia were very rarely present, and all the sporangia appeared to be developing the resting condition in which they produce only asexual zoospores [ibid., xv, p. 524] incapable of causing the cysts observed on the affected plants; thus primary infection appears to have been so rapid and slight as to have escaped notice, and all the cases that were observed must have been due to secondary infections.

Tests by Miss Glynne's method [ibid., v, p. 445] showed that at the beginning of December the percentages of empty, living, and dead sporangia in gall tissue were, respectively, 5 to 10, 10 to 15, and 75, the corresponding figures for the end of February being 53, 16, and 31. Numerous experiments demonstrated that under favourable temperature and humidity conditions the sporangia mature and release zoospores principally from January onwards. During November and December the percentage of empty sporangia present increases slowly. In nature the emission of the zoospores probably occurs later, reaching a maximum towards May, when the average temperature remains at about 21° C.

DUCOMET (V.) & DIEHL (R.). **La galle verruqueuse de la Pomme de terre (Synchytrium endobioticum [Schilb.] Perc.). Mise au point de la question de la résistance des variétés.** [Wart disease of potatoes (*Synchytrium endobioticum* [Schilb.] Perc.). A critical summary of the question of varietal resistance.]—*Ann. Epiphyt.*, N.S., i, pp. 57–79, 2 maps, 1936.

After reviewing the history of the introduction of potato wart disease

(*Synchytrium endobioticum*) [see preceding abstract] into the countries where it prevails the authors state that in France the disease is present only in a few small localized centres of infection near the northern, eastern, and southern frontiers. In the north of France new infection centres are due more to the introduction of foreign tubers than to the spread of already existing diseased areas.

Varietal resistance trials with nearly 300 varieties and numerous hybrids conducted at Russ-Hersbach (Bas-Rhin) from 1926 to 1935, inclusive, gave results which generally agreed with those obtained in other countries. Of the 180 potato varieties grown in France 77·5 per cent. are of foreign origin and only 25 per cent. are resistant. A large number of old French varieties are also susceptible.

Observations in France supported Köhler's views as to infection grades [*R.A.M.*, xi, p. 69], the Ovalgelbe variety showing galls on the leaflets and Sickingen being once slightly attacked; both varieties are placed by Köhler in grade III of tolerance. It appears that under certain conditions favourable to tissue proliferation some reputedly resistant varieties may be very slightly attacked and serve as a source of spread.

The evidence obtained indicated that crosses between resistant varieties invariably, and selfed resistant varieties mostly, gave rise to a certain number of susceptible types in the progeny, while susceptible varieties in some cases gave rise to a few resistant types, though the authors did not personally observe this. The results obtained in some cases support Black's views as to the factorial basis of resistance [ibid., xiv, pp. 465, 788].

A study of tuberiferous species of *Solanum* showed that types susceptible to *S. endobioticum* are present in all chromosome groups.

RALEIGH (W. P.) & BONDE (R.). **Seed-Potato treatment for Rhizoctonia control in northeastern Maine, 1929 to 1933.**—*Phytopathology*, xxvi, 4, pp. 321–343, 1936.

The methods used in the present series of seed-potato treatment experiments in north-eastern Maine corresponded approximately to those followed by Schultz and collaborators in the period 1925 to 1928 [*R.A.M.*, ix, p. 404; cf. ibid., xv, p. 484]. The results [which are fully tabulated] of the tests showed that treatment of tubers infected by *Rhizoctonia* [*Corticium solani*] usually increased the stand, vigour of the plants, and yield, and reduced injury from stem lesions and the percentage of diseased tubers. One of the best treatments against *C. solani* was 1½ hours' immersion in mercuric chloride (1 in 1,000), while three minutes in acidulated mercuric chloride (1 in 500 plus 1 per cent. hydrochloric acid) also gave satisfactory control but tended to damage the tubers. Yellow mercuric oxide (1 in 100), used as a dip, also combated the fungus effectively but was liable to burn the cut surfaces of the tubers. Promising results were given by a solution of 1 in 1,200 mercuric chloride and 1 in 400 potassium iodide (dip), while the organic mercury dips, sanoseed and new improved semesan bel [ibid., xiv, p. 118; xv, p. 486], though superior to the brands formerly on the market, did not quite equal the standard mercuric chloride treatment in efficacy against *C. solani*. Clean Irish Cobblers, treated or un-

treated, in a separate test produced a crop bearing very few *C. solani* sclerotia.

Goss (R. W.). **The effect of irrigated crop rotations upon Potato scab.**—*Amer. Potato J.*, xiii, 4, pp. 91–96, 1936.

Details are given of an experiment which has been in progress in western Nebraska since 1912 to determine the effect of irrigated crop rotations on potato scab [*Actinomyces scabies*: *R.A.M.*, xv, p. 394 and next abstracts]. Eleven $\frac{1}{4}$-acre plots on a well-drained, sandy loam soil were included in the trials, and since 1920 the Bliss Triumph variety has been consistently used.

The average incidence of severe scab from 1929 to 1932, inclusive, in the continuous potato plot was 53·6 per cent., the corresponding figures for the stands following beets, oats, and maize being 55·7, 39·6, and 66·4, respectively. The first indication of a reduction in the amount of infection was obtained in a four-year rotation consisting of beets, lucerne (two years), and potatoes, the incidence of severe scab for the period 1929 to 1932 being only 4·4 per cent. and from 1933 to 1935, 2·5 per cent. Even better results were secured by a six-year programme involving oats, beets, three years of lucerne, and potatoes, the incidence of severe scab in the plots thus treated being reduced to 1·8 and 1 per cent., respectively, during the two periods under review. A noticeable increase in the amount of deep scab was directly correlated with the application of manure to the plots, but in the case of the short rotations this practice would appear to be justifiable by the resultant large increases of yield (127 per cent. following beets, 102 following oats, and 56 following oats and beets).

Cunningham (H. S.). **The addition of mercury compounds to the fertilizer mixture as a control for common scab of the Potato under Long Island conditions.**—*Amer. Potato J.*, xiii, 4, pp. 100–103, 1936.

Very satisfactory control of scab [*Actinomyces scabies*: see preceding abstract] in Irish Cobbler and Green Mountain potatoes in a sassafras silt loam with a gravelly subsoil (P_H 5 to 5·7) in Long Island, New York, was obtained in 1934–5 by the addition to the fertiliser of either yellow oxide of mercury or calomel [mercurous chloride: *R.A.M.*, xv, p. 283] at rates of 4 to 6 lb. per ton, the former probably being adequate for all practical purposes. Yellow oxide of mercury was found to be slightly the more effective of the two, reducing the amount of severe infection to under 1 per cent. in both varieties.

Einfluss der Düngung auf den Schorfbefall der Kartoffeln. [The influence of manuring on scab infection of Potatoes.]—*Superphosphate*, ix, 4, pp. 78–80, 1 fig., 1936. [English and French translations.]

In this paper (abstracted from *Wbl. LdBauernsch. Sachsen*, lxxxiii, p. 1642, 1935) it is stated that Prof. Pieper, of the Dresden Agricultural Experiment Station, recommends the following measures for potato scab [*Actinomyces scabies*: see preceding abstracts] control. Lime should be applied as a top dressing after the emergence of the plants, and not in the spring or autumn before planting. Three to four years later, when the same soil is again planted to potatoes, the lime will be

found to be so extensively decomposed as to constitute no further risk of promoting the disease. The choice of mineral fertilizers is important, alkaline materials, such as nitrate of soda, calcium cyanamide, and basic slag, being liable to induce scab [cf. ibid., xv, p. 415], while sulphate of ammonia and superphosphate prevent its development. These observations were amply confirmed by experiments conducted at Pillnitz from 1932 to 1935 with the Early Zwickau variety.

TAYLOR (C. F.). **A method for the isolation of actinomycetes from scab lesions on Potato tubers and Beet roots.**—*Phytopathology*, xxvi, 4, pp. 387–388, 1936.

The following technique has given satisfactory results during the past six years in the isolation of *Actinomyces* from potato tubers and beetroots. Ten gm. of fresh calcium hypochlorite is shaken in 140 c.c. tapwater, left to stand for a few minutes, and filtered. Just before use 1 part of 25 per cent. sodium hydroxide solution is added to 3 of the filtrate. The plant material is placed in this mixture for two minutes, and on removal, without washing, a slice is cut in such a way as to remove a lesion and the underlying healthy tissue, placed in a few drops of sterilized distilled water in a flamed mortar, and triturated with a flamed pestle. Additional water is then added to the mortar and the diluted suspension pipetted into a sterilized tube, one or two drops from which are placed in the bottom of a Petri dish, followed by 15 c.c. of Waksman's egg-albumin agar (*Soil Sci.*, viii, p. 71, 1919) melted and cooled to 45° C. Colonies develop within a period of two days to three weeks.

KUNKEL (L. O.). **Powdery mildew of Potato in New Jersey.**—*Phytopathology*, xxvi, 4, pp. 392–393, 1 fig., 1936.

In February, 1935, Green Mountain potato plants in the greenhouse of the Rockefeller Institute for Medical Research, Princeton, New Jersey, showed an extensive spotting, chiefly of the upper surfaces of leaves nearing maturity. During cloudy weather a powdery mildew developed over the affected areas and spread to the under sides of the leaves and to the petioles and stems. The barrel-shaped conidia, 34·19 by 18·09 μ, were borne on short conidiophores and the mycelium was attached to the epidermal cells by means of globoid haustoria. In the absence of perithecia, the exact determination of the fungus was impossible, but it is presumed to be *Erysiphe solani* [? *E. cichoracearum*: *R.A.M.*, i, p. 361; vi, p. 250; xiii, p. 681; xiv, p. 83]. This appears to be the first record of potato mildew in the United States.

REINKING (O. A.). **Cylindrocarpon fungus studies.**—*Zbl. Bakt.*, Abt. 2, xciv, 5–8, pp. 134–136, 2 figs., 1936.

Latin diagnoses are given of two new varieties of *Cylindrocarpon* found to be fairly common occupants of the soil [cf. *R.A.M.*, xiv, pp. 378, 791] of banana plantations in Honduras, Costa Rica, Panama, and South America [see next abstract], viz., *C. janthothele* Wr. var. *minus* and *C. olidum* Wr. var. *suaveolens*, the perfect stage of the former being *Nectria mammoidea* Phil. & Plowr. var. *minor*.

Reinking (O. A.). **Cylindrocarpon-isolations from tropical soils.**—*Zbl. Bakt.*, Abt. 2, xciv, 5–8, pp. 137–142, 1936.

The following fungi, in decreasing order of prevalence, were isolated from the soil of low-lying banana plantations in Honduras, west coast of Guatemala, Costa Rica, Panama, and Colombia: *Cylindrocarpon olidum* var. *suaveolens*, *C. olidum*, *C. janthothele* var. *minus* (*Nectria mammoidea* var. *minor*) [see preceding abstract], *C. curvatum* [*R.A.M.*, x, p. 626], and *C. radicicola* [ibid., xiv, pp. 180, 366, 585]. With the exception of the last named, all the organisms were isolated from soil depths varying from 1 to 23 in., *C. radicicola* being found only at and below 5 in. The phytopathological significance of these species of *Cylindrocarpon* has not yet been investigated.

Salmon (E. S.). **Fungus and virus diseases of the Hop; II.**—*J. Inst. Brew.*, N.S., xxxiii, 4, pp. 184–186, 1936.

Continuing his observations on hop diseases in England [*R.A.M.*, xv, p. 461], the writer gives notes on the wilt caused by *Sclerotinia sclerotiorum* [ibid., xv, p. 425], which is reported to have destroyed up to 40 per cent. of the bine in some Midland yards; on two cases of infection by *Armillaria mellea* in 1935, one in Kent and the other in Worcestershire; and on 'fluffy tip' or 'bunchy top' [ibid., xv, p. 424], nettlehead [ibid., xv, p. 462], and mosaic.

Some new symptoms, including splitting of the leaf blade and conspicuous yellowish-green mottling, have frequently been observed both alone and in association with nettlehead; in the former case they appear to be relatively innocuous. Nettlehead proper, however, is stated to present increasing difficulties in old-established Fuggle gardens, which when badly infected should be grubbed up and replanted with the newly developed resistant Brewer's Favourite, Fillpocket, or Quality Hop varieties.

Goodwin (W.) & Salmon (E. S.). **Infectious sterility in Hop gardens in Czecho-Slovakia.**—*J. Inst. Brew.*, N.S., xxxiii, 4, pp. 209–210, 1936.

A summary is given of the main features of the infectious sterility disease of hops in Czecho-Slovakia, based on a recent account by Blattný and Vukolov already noticed from the original source [*R.A.M.*, xv, p. 395].

Abbott (E. V.), Summers (E. M.), & Rands (R. D.). **Disease resistance tests and seedling selections in 1935 at the U.S. Sugar Plant Field Station, Houma, La.**—*Sug. Bull.*, xiv, 12, pp. 3–7, 1936.

The main object and outstanding problem of the seedling programme in sugar-cane breeding work is the development of varieties combining in a single individual disease resistance, productivity, and economical handling, and during 1935 noteworthy progress in these directions is stated to have been made at the Houma Sugar Plant Field Station, Louisiana. Four classes have been differentiated to express the pathological reactions of the test canes, viz., (1) resistant, (2) moderately resistant, (3) susceptible, and (4) very susceptible. The high standards requisite for inclusion in (1), comprising immunity from mosaic [*R.A.M.*, xiv, p. 718], resistance to red rot [*Colletotrichum falcatum*: ibid., xv,

p. 463 and next abstract], and relative freedom from liability to other diseases, preclude many entries, but since 1929 a total of 74 selections have been placed in this group at the Station. C[anal] P[oint] 28/19 is a typical representative of (2), combining freedom from mosaic with moderate resistance to red rot (140 selections now available, making a total, with those of class (1), of 214 commercially resistant canes). In (3) are placed seedlings susceptible to *C. falcatum* but free, or virtually so, from mosaic and only moderately subject to other diseases, e.g., P.O.J. 36–M, Co. 290, and C.P. 29/320. To date the number of selections in this 'borderline' class, the commercial adequacy of which needs further testing, is 205. To (4) belong varieties such as P.O.J. 213, C.P. 807, and C.P. 29/291, which are very susceptible to either or both of the two principal diseases under consideration or are subject to severe infection by other agencies. At present such commercially 'dangerous' canes number 22.

Details are given of the qualities of various selections in the different classes.

Jensen (J. H.). **Notes on the present Sugarcane-disease situation in Puerto Rico.**—*Agric. Notes P.R. agric. Exp. Sta.*, 69, 8 pp., 1936. [Mimeographed.]

The most severe disease of sugar-cane in Porto Rico is mosaic, which, however, is being fairly well controlled in most localities by roguing or the planting of the resistant varieties P.O.J. 2878, Mayaguez 28, P.R. 803, and P.R. 807 [cf. *R.A.M.*, xiv, p. 607]. The presence of different types of mottling in different parts of the island indicate that two or more strains of the virus exist in Porto Rico.

Ring spot (*Leptosphaeria sacchari*) [ibid., xv, p. 397], brown stripe (*Helminthosporium stenospilum*) [loc. cit.], and eye spot (*H. ocellum*) [ibid., xiv, p. 564] occur in all parts of the island but do not cause serious losses, most of the varieties grown not being highly susceptible. Dry top rot (*Plasmodiophora* [*Ligniera*] *vascularum*) [ibid., xiv, p. 397], pokkah-boeng (*Fusarium moniliforme*) [*Gibberella moniliformis*: ibid., xv, p. 397], red stripe (*Phytomonas* [*Bacterium*] *rubrilineans*) [ibid., xv, p. 427], and red rot (*Colletotrichum falcatum*) [see preceding abstract] do not cause serious damage. The cane in a fairly extensive area along the south coast shows symptoms resembling Pahala blight [ibid., xii, p. 788], consisting in a leaf discoloration varying from slight yellowing to almost complete whiteness; only the interveinal parts are affected, the veins appearing dark green. The low manganese content and alkaline condition of the soil indicate that the disease is due to manganese deficiency.

To guard against the importation of cane diseases a moated, screened, and insulated quarantine greenhouse is being erected in Porto Rico where newly introduced cane pieces and other economic plants will be kept under observation.

Baissac (J.). **Diseases and pests of the Sugar Cane in Nossi Bé, Madagascar.**—*Int. Sug. J.*, xxxviii, 448, pp. 130–132, 1936.

In these notes on sugar-cane diseases in Madagascar it is stated that ring spot (*Leptosphaeria sacchari*) [see preceding abstract] is very wide-

spread, the plants readily becoming affected in unfavourable weather conditions. Brown leaf spot (*Cercospora longipes*) [ibid., xiv, pp. 87, 257] often occurs at the end of the dry season. Red spotting (*C. sacchari*) [ibid., xiv, p. 348] also exists. Bobbin-shaped, septate spores measuring 10 to 20 by 3 μ, resembling those of *C. acerosum*, were noted on an indefinite leaf spot. Stem smut (*Ustilago sacchari*) [*U. scitaminea*: ibid., xiii, p. 473] occurs occasionally; usually it does not kill the stool, but in one instance part of a field showed 10 per cent. infection, with many dead plants. Red rot [*Colletotrichum falcatum*: see preceding abstracts] occurs frequently in some varieties, following infestation by borers, and together with scald (*Bacterium albilineans*) is regarded as being the probable cause of the failure of the older varieties, such as Louzier and Iscambine. Pokkah-boeng (*Fusarium moniliforme*) [*Gibberella moniliformis*] affects all types of canes, but appears most often on *spontaneum* hybrids of the first, second, or third nobilizations. Root diseases include seedling damping-off (in clogged soils) associated with a fungus resembling a *Rosellinia* and *Himantia stellifera* [ibid., iv, p. 705]. Leaf scald (*Bact. albilineans*) is widespread; in most cases the whole crown dries up and the top quickly dies without the appearance of white stripes. Even the leaves of the young shoots developed from the lateral buds, after the death of the top, are more often scalded than striped. A bacterial leaf stripe was first observed in 1932 on a seedling of noble origin, since when it has been found on many other canes. The symptoms develop as streaks 2 to 3 mm. long on the fully grown leaves, and ultimately reach the younger ones, followed by a marked shortening of the internodes corresponding to the affected leaves. The diseased stools show rapid growth of the bacteria in the ratoons, with heavy loss of cane by shortening of the stems. *Melanconium* [*Pleocyta*] *sacchari* [ibid., xiv, p. 656] occurs frequently as a weak parasite.

Gäumann (E.). **Mykologische Notizen II.** [Mycological notes II.]—*Ann. mycol., Berl.*, xxxiv, 1–2, pp. 61–68, 1936.

In order to elucidate the connexion between the aecidia on *Euphorbia virgata* and those on hybrids of *E. virgata* and *E. cyparissias* in moist situations near Zürich (both *E. cyparissias* and its hybrid with *E. virgata* being commonly and severely attacked by aecidia of the *Uromyces pisi* group [*R.A.M.*, xi, p. 760]), the writer inoculated with aecidiospores from the first-named host seven Leguminosae, of which only *Vicia cracca* responded by profuse formation of uredosori, indicating that the fungus belongs to the *U. fischeri eduardi* group. Uredospores of the rust from *E. virgata* were only slightly pathogenic to *V. sativa* and failed to attack any of the other species of *Vicia* inoculated except *V. cracca*, indicating the existence of physiologic specialization in *U. fischeri eduardi*. In a third series of tests an abundance of teleutospore-bearing material from plants used in the previous experiments was applied to young shoots of *E. cyparissias*, *E. virgata*, and *E. cyparissias* × *E. virgata* with positive results only in the case of one shoot each of the two first named. Aecidia from these shoots infected *V. cracca*. It is evident from the foregoing data that *E. virgata* is one of the hosts of *U. fischeri eduardi*.

Aecidium hippeastri n.sp. [with a Latin diagnosis], detected on *Hippeastrum bicolor* leaves in Chile, is characterized by densely aggregated, amphigenous pycnidia, 80 to 150 μ in diameter, surrounded by a circle of yellow aecidia producing angular to globose or oblong, densely granular-verrucose, subhyaline spores, 16 to 29 by 15 to 27 μ (mostly 23 to 26 by 19 to 23 μ).

Grigoraki (L.). **L'aleurie : ses formes et sa définition.** [The aleuriospore: its formation and definition.]—*Rev. Mycologie*, i (N.S.), 1, pp. 37–39, 1 fig., 1936.

The author defines aleuriospores as uninucleate spores of variable size resulting from the complete or partial dissociation of the protoplasm of a hypha or sporophore. They may be internal or external, and are classified into four kinds, aleurioblastospores, aleuriochlamydospores, aleurioconidia, and microaleuriospores. The first kind are budded off from the mycelium-like yeasts; the second are pleomorphic, broadly pedicillate when external, and resemble small chlamydospores; the third are of constant size, borne on distinct sporophores, and resemble conidia at first but have no distinct pedicel; the fourth kind are generally formed internally, and are liberated by the rupture of a hypha, as in *Actinomyces*.

Spore forms which may be confused with aleuriospores are arthrospores [*R.A.M.*, xiii, p. 163], entospores (a vague term applied by Vuillemin to various forms), conidia, and chlamydospores. Arthrospores are poly- or uninucleate spores formed by the cutting-off of portions of the thallus, conidia are external, uninucleate spores without glycogen reserves, shed without destroying the mycelium, and chlamydospores are always internal, polynucleate, thick-walled, and variable in size.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, viii, 3, pp. 78, 82–83, 86–93, 1936.

Germany (Hamburg). An Order of 30th March, 1936, provides that Douglas fir [*Pseudotsuga taxifolia*] seedlings must be certified as healthy by the local plant protection authorities before distribution for planting in order to combat the spread of leaf fall [*Rhabdocline pseudotsugae*: *R.A.M.*, xiii, pp. 554, 607].

Holland. An Order of 30th October, 1935, prohibits the cultivation of the potato varieties Bravo, De Wet, and Kampioen and of any other plant deemed by the Minister of Agriculture to constitute a probable source of infection by wart disease (*Synchytrium endobioticum*) [ibid., xv, p. 127].

Sweden. As from 1st April, 1936, all plants imported into the country with root attached must be accompanied by a certificate stating that the site of cultivation, together with a surrounding radius of at least 5 km., is (and has been during the past ten years) free from infestation by wart disease (*S. endobioticum*).

A Proclamation dated 4th April, 1936, and effective as from the 6th, enumerates thirty pathogenic micro-organisms and two diseases the exclusion of which from Sweden is to be the object of special efforts.

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XV | OCTOBER | 1936

HIRATSUKA (N.). **Inoculation experiments with heteroecious species of the Japanese rust fungi. III.**—*Bot. Mag., Tokyo*, l, 592, pp. 213–216, 1936.

Continuing his inoculation experiments with heteroecious Japanese rusts [*R.A.M.*, xiii, p. 813], the writer transferred sporidia from the teleutospores of *Gymnosporangium amelanchieris* (also reported under the names of *G. idetae* [ibid., ii, p. 238] and *G. tremelloides* [ibid., iii, pp. 181, 255; iv, p. 398; vii, p. 33]) on *Juniperus rigida* twigs to the leaves of *Amelanchier asiatica* [*A. canadensis*] and a number of other Rosaceae with positive results in the case of the first named only, on which spermogonia began to appear 15 and aecidia 26 days after inoculation. The writer's studies are stated to afford no justification for the separation of *G. tremelloides* (or *G. idetae*) from *G. amelanchieris*. Similar experiments with *G. japonicum* from *J. chinensis* on *Photinia laevis* var. *villosa* and with *G. juniperi* from *J. rigida* on *Sorbus* [*Pyrus*] *aucuparia* were likewise successful.

HIRATSUKA (N.). **Uredinales collected in Kiushu (III).**—*J. Jap. Bot.*, xii, 4, pp. 265–272, 1936.

An annotated list is given of 41 Uredinales collected in Kiushu, Japan [cf. *R.A.M.*, xv, p. 401], of which the following may be mentioned: *Puccinia pruni-persicae* [ibid., xii, p. 248] and *Tranzschelia* [*P.*] *pruni-spinosae* [ibid., xv, p. 590] on peach; *Pucciniastrum castaneae* [ibid., xii, p. 726] on *Castanea crenata*; and *Phakopsora artemisiae* [ibid., vii, p. 405] on chrysanthemum. A Latin diagnosis is given of *Milesina tobinagai* n.sp. on *Woodwardia orientalis*.

LEPIK (E.). **On the fungus flora of Ruhnu (Runö) Island.**—*S.B. naturf. Ges. Jurjew*, xlii, 1–2, pp. 1–19, 2 graphs, 1 map, 1935. [Received June, 1936.]

The following are among the items of interest in this annotated list of the fungi observed by the writer during a stay on the island of Runö, south-west of Esthonia, in the Gulf of Riga, in 1934. Rust spores are borne by the wind from the mainland (nearest point 40 km. distant); among the rust species detected were *Puccinia lolii* on *Rhamnus cathartica* (all bushes of which were exterminated) [*R.A.M.*, xv, p. 400], *Melampsora lini* on flax, and *Gymnosporangium juniperinum* on *Sorbus*

[*Pyrus*] *aucuparia* [ibid., viii, p. 344]. *Lophodermium pinastri* occurs on pine needles [ibid., xv, p. 473] throughout the island.

BUHR (H.). **Pflanzengallen Mecklenburgs III.** [Plant galls of Mecklenburg III.]—*Arch. Ver. Naturg. Mecklenb.*, N.F., x, pp. 35–51, 1935. [Received July, 1936.]

An annotated list is given of the bacterial and fungal galls affecting plants and trees in Mecklenburg with Latin and German diagnoses of the one new species recorded—*Protomyces cirsii-oleracei* on *Cirsium oleraceum* [*Cnicus oleraceus*].

GADD (C. H.). **Diseases of the Tea bush. II. Root diseases.**—*Tea Quart.*, ix, 1, pp. 5–12, 1936.

In this further paper on tea diseases [cf. *R.A.M.*, xv, p. 321] the author describes in popular terms the symptoms, manner of occurrence, and mode of spread of root diseases with particular reference to those caused by *Poria hypolateritia* [ibid., xiv, p. 657], *Rosellinia arcuata*, *Fomes lamaensis* [*F. noxius*], *Armillaria mellea* [ibid., xiv, p. 14], and *Ustulina zonata* [ibid., x, p. 345]. The paper concludes with some general observations on the connexion between these diseases and the establishment of tea in jungle clearings, the rate at which fungi can kill tea bushes (*F. noxius* killing within a year and *P. hypolateritia* taking two or three years), and the distance from which their attack can be made.

SHEPHERD (E. F. S.). **A new disease of Tobacco, possibly of the virus type.**—*Leafl. Dep. Agric. Mauritius*, 40, 3 pp., 1 pl., 1936.

In a field of tobacco infected with mosaic in Mauritius, the author observed on 20th September 1935 a single plant showing an acute form of mosaic with severe mottling and marked distortion of the leaves, the pronounced development of marginal veins causing a puckering of the lamina 'as though a stitch had been run through the whole length of the leaf on each side'. Enations were strongly developed on the under surface. The disease was transmitted to healthy plants by an aqueous extract of dried infected material applied by a cotton wad. The affected field was abandoned by the grower, and as many of the plants developed the above-mentioned symptoms they were destroyed. In an addendum the author states that he thinks the disease may be a destructive form of tobacco mosaic [*R.A.M.*, xii, p. 538].

MATSUMOTO (T.). **Serological analysis of the infective agents causing Tobacco mosaic with malformed flowers.**—*Trans. nat. Hist. Soc. Formosa*, xxvi, pp. 258–261, 1 fig., 1936. [Japanese, with English summary.]

A peculiar malformation of tobacco flowers observed by the writer during his studies on virus diseases was ascertained by precipitin-absorption experiments to be due to a virus complex of which the two components are common tobacco and potato mosaic. The trouble is therefore identical with, or very closely related to, tomato streak [*R.A.M.*, xv, pp. 123, 406], caused by a combination of the tomato (tobacco) and potato mosaic viruses. Confirmatory results were given by inoculation experiments.

STANLEY (W. M.). **Chemical studies on the virus of Tobacco mosaic. VI. The isolation from diseased Turkish Tobacco plants of a crystalline protein possessing the properties of Tobacco mosaic virus.**—*Phytopathology*, xxvi, 4, pp. 305–320, 1 fig., 1936.

This is an expanded account of the writer's report on the isolation from diseased Turkish tobacco plants of a crystalline protein with the properties of the tobacco mosaic virus [*R.A.M.*, xv, p. 177], a preliminary note on which has already appeared from another source [ibid., xv, p. 404].

CALDWELL (J.). **Factors affecting the formation of local lesions by Tobacco mosaic virus.**—*Proc. roy. Soc.*, ser. B., cxix, 815, pp. 493–507, 1 pl., 3 graphs, 1936.

In this paper the author records a method of determining in inoculation experiments whether an inhibitor, which added to the virus inoculum has reduced or suppressed the formation of leaf lesions, is acting directly on the virus itself or on the host tissues (by reducing their susceptibility), or on both simultaneously.

By plotting concentrations of virus (abscissae) against the number of lesions formed (ordinates) a curve is obtained which at the lower concentrations is more or less a straight line, with a slope of 1, but at the higher tends to flatten out as there are no longer any susceptible areas available on the leaf and additional virus has no appreciable effect on the number of lesions produced. When an inhibitor is added which acts on the leaf tissues, but not on the virus, the curve becomes horizontal earlier than the curve for the untreated virus, whereas if the inhibitor acts on the virus only the original curve is displaced to the right.

Using tomato aucuba mosaic (Johnson's tobacco virus 6) and tomato ordinary mosaic (tobacco virus 1) and applying this method, the author shows that the inactivating effects of trypsin, silver nitrate, and normal rabbit or horse serum are due to action of these agents on the virus itself.

In conclusion, it is pointed out that if used with products of known reaction on proteins and other substances this method furnishes a means of studying the chemical nature of the virus agent itself.

SAREJANNI (J. A.) & STAMATINI (N.). **Le Phytophthora du Tabac en Grèce.** [The Tobacco *Phytophthora* in Greece.]—*Ann. Inst. phytopath. Benaki, Greece*, i, 3, pp. 51–56, 1 pl., 1935. [Received July, 1936.]

Infection of tobacco by *Phytophthora*, first observed by the junior author in Macedonia in 1930, but thought very probably to have been present there and in Asia Minor before the war, produced three types of disease in Greece: (1) seedling damping-off, (2) a general wilt of the leaves, and (3) brown, necrotic, interveinal spots on the leaves. The causal organism was identified as *P. parasitica nicotianae* [*R.A.M.*, xiv, pp. 608, 743]. Satisfactory control was obtained in tobacco seed-beds by watering the soil with formalin solution (1 in 50) applied at the rate of 5 l. per sq. m. Also, when seedlings from infected beds were subjected to immersion in 1 per cent. Bordeaux mixture only 2 per cent. developed

infection, as compared with 10 per cent. in the untreated controls, the amount of injury resulting from the treatment being entirely negligible.

SMITH-WHITE (S.), MACINDOE (S. L.), & ATKINSON (W. T.). **Resistance of Nicotiana species to blue mould (Peronospora tabacina Adam).** —*J. Aust. Inst. agric. Sci.*, ii, 1, pp. 26–29, 1936.

Tests (in heated and unheated glass-houses) of resistance to *Peronospora tabacina* [*R.A.M.*, xv, p. 121 and next abstracts] by over 250 varieties and strains of *Nicotiana tabacum*, 21 varieties of *N. rustica*, and a number of introduced and native species of *Nicotiana* in New South Wales indicated that some geographical groups of *N. tabacum* varieties showed a slight relative tolerance, and that *N. rustica* showed rather more tolerance, though this was not high and was of doubtful value in breeding. No resistance greater than that of *N. rustica* was found in the introduced species, though some of these if more compatible with *N. tabacum* may be useful in breeding work. Preliminary results with five native species indicated that high resistance or even immunity might be expected in Australian forms; of these five, the 24-chromosome species *N. debneyi* is most likely to be of value in breeding as it most closely corresponds to the American species in morphological characters. It is significant as indicating the possible origin of *P. tabacina* that the native Australian species tested were all more resistant than the introduced ones.

HENDERSON (R. G.). **Effect of nutrients on susceptibility of Tobacco plants to downy mildew.**—Abs. in *Phytopathology*, xxvi, 2, p. 94, 1936.

In sand-culture experiments, tobacco plants grown in solutions low in nitrogen or high in potassium were very susceptible to downy mildew [*Peronospora ? tabacina*: see preceding and next abstracts], whereas considerable resistance was shown by those receiving little potassium and a fair supply of nitrogen. In outdoor beds the disease usually appears first on stunted plants and on those growing near old stumps where a deficiency of nutrient elements may be expected.

HENDERSON (R. G.). **Promising fungicides for Tobacco downy mildew control.**—Abs. in *Phytopathology*, xxvi, 2, p. 94, 1936.

Good control of downy mildew [*Peronospora? tabacina*] on greenhouse and outdoor tobacco [see preceding abstracts] is stated to have been given by spraying with cuprous oxide (1 lb. to 100 galls. water) and benzoic acid ($\frac{1}{4}$ lb. to 100 galls.), with the addition in each case of 1 per cent. cottonseed oil emulsion. Linseed oil and benzoic acid also gave satisfactory results in one trial, while picric acid was less effective and injured the foliage.

HILL (A. V.). **Cercospora leaf-spot (frogeye) of Tobacco in Queensland.** —*Bull. Coun. sci. industr. Res. Aust.* 98, 46 pp., 7 pl., 6 graphs, 1936.

A tabulated account is given of the writer's studies on frog-eye of tobacco (*Cercospora nicotianae*) in Queensland [*R.A.M.*, xiv, p. 425; xv, p. 121]. In addition to information already presented in this *Review*

from other sources, the following facts are of interest. Evidence is adduced to show that *C. raciborskii* Sacc. & Syd. [ibid., xiii, p. 657] and *C. solanicola* Atk. [ibid., xiv, p. 87] are morphologically indistinguishable from *C. nicotianae* E. & E., and should therefore be regarded as synonyms of the last named on grounds of priority. Twelve species of *Nicotiana*, *Datura stramonium*, and *Nicandra physaloides* contracted frog-eye symptoms following inoculation in the greenhouse with a conidial suspension of *C. nicotianae* or with fragments of mycelium from agar cultures, the latter method only being successful in the cases of tomato, eggplant, chilli (*Capsicum annuum*), and three species of *Solanum*. Several plants of *D. stramonium* in a tobacco field were found to be partially defoliated in 1934 by a species of *Cercospora* which produced the typical frog-eye lesions on tobacco seedlings inoculated in the greenhouse.

VALLEAU (W. D.) & JOHNSON (E. M.). **Physalis subglabrata: a natural host of Bacterium angulatum.**—*Phytopathology*, xxvi, 4, pp. 388–390, 1936.

Smooth ground cherry (*Physalis subglabrata*) plants growing at a distance from tobacco at the Kentucky Agricultural Experiment Station were found to be extensively infected by the angular leaf organism (*Bacterium angulatum*) [*R.A.M.*, xv, p. 179], which was isolated from 37 out of 39 examined, as well as from one of clammy ground cherry [*P. heterophylla*], and inoculated with positive results into tobacco. *Bact. angulatum* was also isolated from flea beetles [*Epitrix parvula*] which feed on *Physalis* in the spring and later migrate to tobacco, often causing severe injury, and from garden flea hoppers [*Halticus citri*]. *Bact. angulatum* and *Bact. tabacum* both survive the winter on tobacco refuse in the open, and there is no reason to suppose that *Physalis* foliage does not serve the same purpose. The evidence here presented seems at any rate sufficient to implicate *P. subglabrata* as one of the means of dissemination of *Bact. angulatum*.

MCILVAINE (T. C.) & GARBER (R. J.). **Inheritance of resistance to root rot in Tobacco caused by Thielavia basicola.**—*J. Amer. Soc. Agron.*, xxviii, 4, pp. 279–283, 1 fig., 1936.

For some years past attempts have been in progress at the West Virginia Agricultural Experiment Station to develop by hybridization and selection a strain of Burley tobacco resistant to root rot (*Thielavia* [*Thielaviopsis*] *basicola*) [*R.A.M.*, xv, pp. 178, 536]. In this connexion data (based on the correlation between the disease and dwarfing) are presented and briefly discussed which indicate that resistance to root rot is heritable as a dominant or partially dominant character [ibid., i, p. 93].

MOORE (E[NID] S.) & SMITH (A. J.). **Pests and diseases in Tobacco seedbeds.**—*Fmg S. Afr.*, xi, 121, pp. 135–138, 9 figs., 1936.

Popular notes are given on the following diseases of tobacco in South Africa: damping-off (*Pythium* and *Rhizoctonia* spp. and other organisms), black root rot (*Thielavia* [*Thielaviopsis*] *basicola*) [see preceding abstract], wildfire (*Bacterium tabacum*), angular leaf spot (*Bact.

angulatum), mildew (*Erysiphe cichoracearum*) [ibid., xv, p. 469], *Fusarium* wilt [*F. oxysporum* var. *nicotianae*: ibid., xiv, pp. 85, 126], mosaic [ibid., xiv, p. 474], leaf curl, and kromnek [ibid., xv, p. 425].

PAGUIRIGAN (D. B.), TUGADE (P.), & DE PERALTA (F.). **Progress report on the green-leaf spot of Philippine wrapper leaf Tobacco.** —*Philipp. J. Agric.*, vii, 1, pp. 87–117, 1 col. pl., 1 fig., 2 graphs, 1936.

The green leaf spot of wrapper tobacco, which has caused severe damage in the Philippines of recent years [*R.A.M.*, viii, p. 635], has been found to be due to the premature death of the cells associated with high temperatures and excessive atmospheric humidity such as are apt to develop among plants grown under abacá cloth shade. The rapid transpiration of the thin, non-cutinized leaves produced under these conditions involves the protoplasmic dehydration and ultimate destruction of the tissues. The trouble may be minimized by harvesting the leaves when there is no moisture film on their surfaces, and by maintaining the temperature of the curing house during the first week (i.e., until the foliage begins to turn brown) at 27° C. with a relative humidity of 75 per cent.

NEERGAARD (P.). **Virussygdomme paa Tomat.** [Virus diseases on Tomato.]—Reprinted from *Gartnertidende, 1936*, 8, 11 pp., 3 figs., 1936.

A tabulated account is given of the symptoms, geographical distribution, mode of transmission, and alternate hosts of the following virus diseases of the tomato, with bibliographical references: ordinary mosaic (tobacco virus 1) [*R.A.M.*, xv, p. 181], yellow mosaic (tobacco virus 6) [ibid., xiv, p. 660; xv, p. 533], mixed virus streak (either tobacco virus 1 or 6 or tomato streak virus 1+potato virus X, or tobacco virus 1+ spotted wilt) [ibid., xiv, pp. 261, 661; xv, p. 123], stem necrosis streak (tobacco virus 9) [ibid., xv, p. 182], bunchy top [ibid., xi, p. 481; xv, p. 182], delphinium stunt [ibid., xiii, p. 638], ring mosaic streak [ibid., xv, p. 182], single virus streak (streak virus 1) [ibid., xiv, p. 261], mosaic (potato virus X = healthy potato virus = latent virus and virulent latent virus) [ibid., xiv, p. 661], spot necrosis (potato rugose mosaic virus = 'veinbanding' virus+potato virus X) [ibid., xi, p. 595], 'veinbanding' ('veinbanding' virus, probably identical with potato virus Y) [ibid., xiii, p. 463], fern-leaf (cucumber virus 1) [ibid., xiv, pp. 83, 218, 681; xv, p. 264], spotted wilt [ibid., xv, p. 444], psyllid yellows [ibid., xiv, p. 117], leaf roll or curly top (sugar beet curly top virus) [ibid., xv, p. 123], big bud [ibid., xv, p. 182], and witches' broom (potato witches' broom virus) [ibid., viii, p. 679]. Of these diseases, only mosaic, streak, and fern-leaf are definitely known to occur in Denmark [ibid., x, p. 704].

HOWELLS (D. V.). **Phytophthora disease of Tomatoes (toe rot).**—*Scot. J. Agric.*, xix, 1, pp. 47–50, 3 pl., 1936.

For a number of years tomatoes in many glass-houses in Scotland have been affected by a very troublesome root rot chiefly affecting the tip of the main root and caused by an unnamed species of *Phytophthora*

differing considerably from *P. cryptogea* and *P. parasitica*, both of which have also been isolated from affected plants. The first record was in Lanarkshire in 1929, but the disease has since occurred in eight other counties and presents a serious menace to the industry. It appears in seedlings in pots and after the tomatoes have been set out in the borders. Detection while the plants are in the seed-boxes is difficult, as only those with blackened or destroyed roots are recognizably infected; in the pots the presence of infection may be masked. In all cases the immediate source of infection is the soil, spread usually taking place by means of infected plants.

Affected plants wilt by day but revive at night. The leaves and stem are dark green to dark blue, the under-surfaces of the former often being purple. The leaves are poorly developed and pointed, and the stem is thin and hard. The root core is generally brown and hard, while in severe cases the central root is dead and dry, with a curiously pointed tip. The new rootlets formed are attacked in turn.

The control measures recommended consist in discarding all the seedlings in any seed-box affected; all suspicious pot seedlings should be examined while young, and if affected, either burnt or the main roots cut away to about half an inch above the level of the decay, after which re-potting should be effected and the plants watered with a solution of mercuric chloride (1 oz. per 20 galls.), nitrate of potash (1 oz. per 2 galls.) being applied two days later.

HUELSEN (W. A.). **New wilt-resistant Tomatoes for Illinois.**—*Canning Tr.*, lviii, 35, pp. 10–12, 1936.

Notes are given on the yield data and other features observed from 1930 to 1935 in connexion with the development at the Illinois Agricultural Experiment Station of the wilt- (*Fusarium*) [*bulbigenum* var. *lycopersici*] resistant tomato varieties, Prairiana, Early Baltimore, and Illinois Pride, all of which have been released to the public for cultivation in the field [cf. *R.A.M.*, xiii, p. 218].

SCHWERDTFEGER (F.). **Die wichtigeren forstpathologischen Arbeiten des Jahres 1935. Kritische Übersicht.** [The outstanding studies on forest pathology of the year 1935. A critical survey.]—*Forstarchiv, 1936*, 9, pp. 142–148, 1936.

The writer concisely summarizes the outstanding literature of 1935 on silvicultural pathology in Germany and some neighbouring countries. Most of the relevant phytopathological material has been noticed from time to time in this *Review*.

BUISMAN (CHRISTINE). **De resistente Iep Nr 24.** [The resistant Elm No. 24.]—*Tijdschr. ned. Heidemaatsch.*, xlviii, 2, pp. 73–76, 1936.

Particulars are given of the growth habit, constitution of the wood, and other points of interest in connexion with selection No. 24 of *Ulmus foliacea*, which has given ample evidence of resistance to *Graphium* [*Ceratostomella*] *ulmi* [*R.A.M.*, xv, p. 542] in variety trials in different parts of Holland and is being propagated for commercial distribution. Apart from a few minor disadvantages, No. 24 is considered to be a

valuable addition to the material available for breeding for immunity from the elm disease.

Arnaud (G.) & Barthelet (J.). **Le nérume ou pourriture noire des Châtaignes (Sclerotinia pseudo-tuberosa et Rhacodiella castaneae).** [Nerume or black rot of Chestnuts (*Sclerotinia pseudotuberosa* and *Rhacodiella castaneae*).]—*Ann. Epiphyt.*, N.S., i, pp. 121–146, 10 figs., 1936.

In this account of their investigations into black rot of chestnuts (*Sclerotinia pseudotuberosa*) [*R.A.M.*, x, p. 696] the authors give a detailed description of the microconidial (*Rhacodiella castaneae*) and apothecial stages, the latter being obtained only in culture. The microconidial form is of the same type, but specifically distinct from those of other species of *Sclerotinia*; but in its extreme variability *R. castaneae* presents analogies with the microconidial forms of other groups of fungi belonging to widely separated genera in which the microconidia have wrongly been considered to be endogenous. The genus *Rhacodiella* itself is considered as only slightly distinct from *Endoconidium*. A list is given of Discomycetes found on the chestnut, notes being added on *Phoma endogena* [ibid., viii, p. 614] and species of *Melanospora* found on this host.

The disease is prevalent on the silica soils of the Massif Central and Cévennes regions of France and probably is also present in the forests near Paris; it also occurs in Italy, where it is known as 'nerume'. In the vicinity of Versailles no diseased nuts were found in 1935 during the normal fall in October, but 30 per cent. of the nuts left on the ground until December were infected. As there are usually no external symptoms selection during gathering is impracticable. It would appear to be advisable to collect the nuts as they fall and store them in a cold, relatively dry place.

[A shorter version of this paper appears in *C.R. Acad. Agric. Fr.*, xxii, 2, pp. 48–51, 1936.]

Pavari (A.). **Il Castagno giapponese (Castanea crenata Sieb. et Zucc.).** [The Japanese Chestnut (*Castanea crenata* Sieb. & Zucc.).]—*Alpe*, xxii, 11–12, pp. 381–389, 6 figs., 1935.

An account is given of the botanical characters of the Japanese chestnut (*Castanea crenata*), of its introduction into Europe with a view to replacing the losses in the indigenous *C. sativa* plantations destroyed by ink disease (*Phytophthora cambivora*) [*R.A.M.*, xv, p. 540], and of Italian experience in its value for this purpose. Two lines of experimentation are in progress, namely, the grafting of the Japanese on the native varieties and vice versa, and the cultivation of the former direct from seed. The first method is stated to be giving satisfactory results, e.g., in the forest of Vallombrosa, while in regard to the second project, success is limited by the exacting requirements of the exotic species in respect of climatic and soil conditions and the like. The nuts of the Shiba variety are small and suitable only for fodder, whereas those of Tamba are large and sweet.

MARIANI (G.). **Il Castagno giapponese in Provincia di Cuneo.** [The Japanese Chestnut in the Province of Cuneo.]—*Alpe*, xxiii, 1–2, pp. 5–8, 6 figs., 1936.

Practical recommendations are made for the grafting of scions of the native Italian chestnut varieties [*Castanea sativa*] on Japanese stocks [*C. crenata*] in connexion with the campaign against ink disease (*Blepharosphora* [*Phytophthora*] *cambivora*) [see preceding abstract].

MILLER (P. W.). **Filbert blight and its control.**—*Ext. Bull. Ore. agric. Coll.* 486, 8 pp., 8 figs., 1936.

Filbert [*Corylus avellana*] bacterial blight (*Phytomonas* sp.) [? *Bacterium juglandis*: *R.A.M.*, xiv, p. 204] occurs in the United States only in the States of Oregon and Washington, where in two- to four-year-old orchards the disease frequently kills 10 to 25 per cent. of the trees. The roots and nuts are not affected, but the yield may be reduced by the death of numerous buds (both leaf and pistillate), twigs, and branches. The most serious aspect of the disease, however, is the formation of cankers on the larger branches and trunk, particularly when the cankers girdle and kill the trees. Angular to irregular, reddish-brown dead spots appear on the leaves, but premature defoliation is not usual. On shoots of the current season's growth the first sign of infection is often seen near an old diseased bud scale at the base of the shoots where dark green, water-soaked areas, later turning reddish-brown, are developed. Infection of one-year-old twigs takes place indirectly through wounds or from blighted buds and diseased shoots of the current season's growth.

The bacterium overwinters in the branch and trunk cankers, and the chief natural agent of spread is atmospheric moisture, though pruning and suckering implements also play a part, infection generally occurring in late spring and early summer.

Studies over a period of four years indicated that some measure of control is obtained by removing all detectable sources of infection before the autumn rains set in and preferably at midsummer. All pruning implements and pruning wounds should be properly disinfected. Evidence was obtained that the incidence of the disease is appreciably reduced by spraying during autumn with Bordeaux mixture 4–4–50, just before the leaves fall. A similar application in late winter or early spring when the leaf buds are in the early green-tip stage is also of some value.

Of the more important commercial varieties Barcelona, Du Chilly, White Aveline, and Brixnut are those most severely attacked, Daviana and Bolwyller being considerably resistant.

JØRSTAD (I.). **Melding om soppsykdommer pa skogtraerne i arene 1931–1935.** [Report on fungous diseases of forest trees in the years 1931–1935.]—*Beretn. norsk. Skogv., 1935*, pp. 83–100, 1936.

Notes are given on the diseases of forest trees observed in Norway from 1931 to 1935 [cf. *R.A.M.*, xi, p. 136]; the following are among the many items of interest. *Cronartium flaccidum* (*Peridermium pini* var. *corticola*) [ibid., xii, p. 406 and next abstract] was prevalent in a number of northerly localities, occurring in a severe form in 1933 in a ten-year-old

French mountain pine [*Pinus montana gallica*] plantation in the vicinity of a freshly infected common pine [*P. sylvestris*]. White currants (Dutch Grape), *Ribes aureum*, and *R. sanguineum* were attacked in nurseries by *Cronartium ribicola*, but the common red currant (Viking) [ibid., xiv, p. 377] is immune.

There is reason to believe that *Crumenula pinicola* [ibid., xiii, p. 665] assumes two forms on pines, a definitely parasitic one in which the conidial stage (*Brunchorstia pinea*) predominates, and a milder phase associated chiefly with the perfect stage. *Thecopsora areolata* [ibid., xv, p. 411] occurred in an epidemic form on plums in eastern districts in 1935; it does not, however, produce teleutospores on the leaves of this host, so that basidiospores from overwintered bird-cherry [*Prunus padus*] foliage constitute the main source of spruce infection. *Chrysomyxa pyrolae* [ibid., xi, p. 214] var. *pyrolata* (Schw.) Jørst. has been observed to form two uredo generations on *Pyrola secunda* but only one on other *P.* spp., of which *P. minor* is the most commonly parasitized by the rust in Norway. *C. abietis* [ibid., xv, p. 411] was more prevalent than usual both in 1931 and 1934 in Telemark and caused extremely heavy damage to the current year's needles in Sør-Trøndelag in 1935. In 1934 the rust was also found on *Picea sitchensis* (a new host for Norway). *Ascochyta piniperda* [ibid., xii, p. 667], not hitherto reported from Norway, was observed in company with *Rhizosphaera pini* [ibid., viii, p. 275] on dead spruce needles in Leinstrand in 1935 and on those of *P. pungens* at an altitude of 850 m. above sea-level in Ringebu in 1934.

The most extensive damage to larches from *Dasyscypha willkommii* [ibid., xv, p. 131] occurs on the west coast, where all varieties are affected. The saprophyte *D. calycina* [ibid., xiv, p. 264], generally coextensive with *D. willkommii*, was found alone in a European larch planting in Stor-Elvdal.

Three-year-old nursery plants of *Abies lasiocarpa* were affected by girdling due to *Pestalozzia hartigii* [ibid., xi, p. 80], which also caused needle discoloration of a fully grown pine, both records dating from 1934.

The aspen rust, *Melampsora tremulae*, is stated to consist of four 'races', all with different alternate hosts, viz., *M. pinitorqua* [ibid., ii, p. 529; vi, pp. 201, 701; xiv, p. 663] on pine, *M. laricis* [*M. larici populina*: ibid., xiv, p. 464] on larch, *M. rostrupii* [ibid., x, p. 418] on *Mercurialis perennis*, and *M. magnusiana* Wagn. on *Chelidonium majus* and *Corydalis*. Aspens and pyramid poplars [*Populus nigra* var. *pyramidalis*] are commonly attacked by scab (*Venturia populina* or *V. tremulae*) [ibid., xv, p. 328], which was also observed on *P. alba*. *Pseudopeziza populorum* (*Marssonina populi-nigrae*) was a frequent agent of defoliation in *Populus nigra* and was further detected on *P. berolinensis* in a nursery.

Uncinula tulasnei is prevalent on Norway maples [*Acer platanoides*] and causes considerable damage in nurseries [ibid., xi, p. 136]. *U. bicornis* was occasionally observed on sycamores [*A. pseudoplatanus*] and *A. campestre*. Limes [*Tilia*] in nurseries are subject to severe injury by *Pyrenochaeta pubescens* [ibid., xiii, p. 10]. Birches were attacked in 1931 by *Diaporthe aristata* [ibid., xi, p. 136]. The *Oidium* stage of a

fungus apparently identical with *Microsphaera alphitoides* [*M. quercina*: ibid., xv, p. 473] was observed on beech seedlings, a new host for the organism in Norway.

Notes are also given on the wood rots of soft and hardwoods caused by a number of well-known Basidiomycetes.

Mathiesen (A.). **Männikoore-pôletik kui tôbi, mida meil tuleb mônes metskonnas tôsiselt arvestada.** [Pine blister rust as a disease demanding serious consideration in certain silvicultural areas.]—*Mitt. Lehr-VersReviers Univ. Tartu* 2, pp. 123–157, 9 figs., 1935. [Esthonian, with German summary.]

Blister rust of pines (*Peridermium pini* f. *corticola*) [see preceding abstract] is stated to be particularly severe in Esthonia in 20- to 50-year-old stands, in which both vigorous and sickly trees are equally liable to attack. Poverty of the soil may also permit infection in younger trees, which the fungus enters chiefly through the sites of insertion of the lateral branches. The extension of the disease frequently coincides with epidemics of the bark beetle (*Myelophilus piniperda*) and pine moth (*Fidonia piniaria*) [*Bupalus piniarius*]. The rupture of the spore layers takes place in the middle of June, and by the autumn of the same year the entire top of the young tree from the place of infection upwards is withered. The rust attacks the trunks as well as the branches. Control measures should include the timely eradication of diseased trees and the cultivation of mixed stands, birch and alder being suitable for this purpose under local conditions.

Terrell (A. B.). **Larch canker.**—*Quart. J. For.*, xxx, 2, pp. 158–160, 1936.

Larch trees growing in two plantations (one on chalk and the other on tertiary clay soil) in Hampshire and badly infected by canker [*Dasyscypha calycina*: see preceding page] were treated by cutting off and burning the diseased branches and dressing the wounds on the trunks with coal-tar. At the same time measures were taken to ameliorate the condition of the trees by extermination of rabbits, thinning, and underplanting. In both sites the larches rapidly recovered from the disease.

Stickel (P. W.) & Marco (H. F.). **Forest fire damage studies in the north east. III. Relation between fire injury and fungal infection.**—*J. For.*, xxxiv, 4, pp. 420–423, 1 fig., 1936.

Periodical inspections of burnt-over forest areas in the north-eastern United States have shown that infection by wood-destroying fungi takes place so rapidly after a fire [cf. *R.A.M.*, xv, p. 409] that the speedy removal of all butt-scorched trees is a sound silvicultural practice. Generally speaking, not more than two growing seasons should be allowed to elapse between fire injury and felling. Within three years after a fire the percentages of infected living trees in the red spruce (*Picea rubra*) and scarlet, black, and chestnut oak (*Quercus coccinea*, *Q. velutina*, and *Q. montana*) cover types inspected were 28 and 45, respectively, the corresponding figures for rot in dead trees being 29 and 18 per cent., respectively.

Of the fungi concerned in the infections only one, *F. igniarius* var. *laevigatus*, is a true heartwood-rotting fungus, infection by which presumably occurred previous to the fire. The path followed by the organisms generally coincides closely with the outlines of the bark discoloured by fire.

Graff (P. W.). **North American Polypores. I. Polyporus squamosus and its varieties.**—*Mycologia*, xxviii, 2, pp. 154–170, 1936.

The author discusses the distribution of *Polyporus squamosus* [*R.A.M.*, xiv, p. 794] in North America (where in contrast with its prevalence in Europe, it is rare), lists and also discusses the synonymy of the fungus, and gives notes on three readily distinguishable varieties, *P. squamosus* var. *polymorphus* (Bull.) comb. nov., found in England and France, *P. squamosus* var. *glaber* (Batt.) comb. nov., rare in New York, Pennsylvania, Ohio, and Europe, and *P. squamosus* var. *fagicola* (Murr.) comb. nov. found in Maine and New York.

McCormack (Helene W.). **The morphology and development of Caliciopsis pinea.**—*Mycologia*, xxviii, 2, pp. 188–196, 2 pl., 1936.

Caliciopsis pinea Peck occurs in smooth, depressed cankers (which it apparently causes) on the trunks and branches of *Pinus strobus* and other coniferous hosts, abundantly in New York, and not uncommonly throughout the north-eastern United States. In the cortical tissues it forms small, cushion-shaped stromata, which rupture the bark and assume a lobed appearance, the lobes developing into spermogonia and ascocarps.

The black, pycnidium-like spermogonium, 100 to 150 μ in diameter at maturity, is filled with rod-shaped to allantoid, hyaline or slightly yellowish, single-celled spermatia, 2·5 to 3·5 μ in diameter. The mature ascocarp is a stromatic column, 1·75 to 2·5 mm. high, with an apical or sub-apical enlargement containing a single ascigerous locule, and with a dull to shiny, coriacious surface that becomes gelatinous when moist; occasionally the column is branched and it is often swollen at the base, where spermogonia are frequently clustered. The ovate asci measure 12 to 19 by 5 to 8 μ, have long slender stalks, and contain eight small, ellipsoidal to nearly globose, golden-brown ascospores which are freed by the deliquescence of the wall and pushed out through the opening, giving the tip of the column a reddish-brown, fuzzy appearance. Full descriptions are given of the development of the spermogonium and ascocarp. The author regards the genus as belonging to the Pyrenomycetes, falling near the Coryneliaceae [cf. *R.A.M.*, x, p. 753].

Miller (J. H.) & Wolf (F. A.). **A leaf spot of Honey Locust caused by a new species of Linospora.**—*Mycologia*, xxviii, 2, pp. 171–180, 2 figs., 1936.

A description is given of a fungus widely prevalent in the southern United States on *Gleditsia* [*Gleditschia*] *triacanthos* and hitherto commonly designated as *Melasmia hypophylla*. The authors show, however, that the conidial stage is an acervulus of the *Gloeosporium* type and not a pycnidium; it may be recognized by the presence of numerous, flat, black, subcuticular fructifications on the lower leaf surface. The

oblong, straight, or slightly curved conidia measure 3 to 5 by 1 to 1·5 μ. The perithecial stage develops in infected leaves in moist places under the trees, the blunt cylindrical beaks projecting usually from the upper surface. Paraphyses are present, but those interspersed with the asci are digested and disappear as the asci mature. The asci are cylindrical, straight or curved, with no stipe, with a thickened apical wall and tubular pore, and measure 80 to 110 by 10 to 15 μ. The filiform, hyaline ascospores measure 70 to 90 by 3 μ. The bases of the asci are readily soluble in water, and in free hand sections the entire mass of asci separates. The fungus is regarded as a new species of *Linospora* and is named *Linospora gleditsiae* n.sp., with a Latin diagnosis of perithecial and conidial stages.

SPRADLING (MAE). **Penetration of Trichoderma lignorum into sapwood of Pinus taeda.**—*J. agric. Res.*, lii, 7, pp. 541–546, 1 fig., 2 diags., 1936.

The results of the experiments briefly discussed in this paper showed that *Trichoderma lignorum* (which is stated to have been frequently isolated by the author from the interior of wood) was able to penetrate through natural openings of the wood into both steamed and unsteamed sapwood of *Pinus taeda*, its advance in steamed wood being about four times more rapid than in the unsteamed. At the end of the test the hyphae of the fungus were most numerous in the ray parenchyma and the wood tracheids, but they also were present in the ray tracheids and resin ducts. No significant difference in rate of penetration was found between the cellulose-dissolving and the non-cellulose-dissolving strains of the fungus which were tested, and the difference in moisture content between the steamed and unsteamed wood did not appear to be the cause of the difference in the rate of advance in them.

SCHEFFER (T. C.) & LINDGREN (R. M.). **The effect of steaming on the durability of unseasoned sap-gum lumber.**—*J. For.*, xxxiv, 2, pp. 147–153, 1 fig., 1 graph, 1936.

Preliminary steam treatment of sap-gum (*Liquidambar styraciflua*) timber as practised in certain sawmills, involving 6 to 35 hours' exposure to temperatures ranging from 150° to 190° F., was experimentally shown to reduce the resistance of the unseasoned wood to *Polyporus* [*Polystictus*] *versicolor* [*R.A.M.*, xv, p. 186] under controlled laboratory conditions. The increased susceptibility to decay occasioned by steaming became more pronounced with each progressive test period, and the rate of decay was more uniform in the treated than in the untreated wood. Some practical recommendations for obviating the deleterious results of steaming are given.

FINDLAY (W. P. K.). **Influence of certain calcium compounds on the rate of decay of wood by fungi.**—*J. Soc. chem. Ind., Lond.*, lv, 16, pp. 103T–105T, 1936.

Using the standardized wood-block method for the testing of timber preservatives [*R.A.M.*, xv, pp. 133, 333], the writer investigated the effects of the introduction of certain calcium compounds [ibid., xv,

p. 131 and next abstract] on the rate of decay of Scots pine (*Pinus sylvestris*), beech, and oak by certain fungi.

Neither saturated lime-water nor 0·5 per cent. calcium acetate exerted any detrimental action on the strength of the wood; on the contrary, the growth of *Merulius lacrymans* and (to some extent) that of *Poria vaporaria* in Scots pine was checked by these treatments, which were without apparent effect on *Coniophora cerebella* [*C. puteana*] and *Lentinus lepideus* [ibid., xv, p. 332]. There was no difference between the beech blocks impregnated with lime-water and the untreated controls in respect of the incidence of decay by *Polystictus versicolor*. On the other hand, the oak heartwood blocks treated with lime-water or 1 per cent. calcium acetate showed significantly more decay by *P. versicolor*, *Stereum hirsutum*, and *Phellinus* [*Fomes*] *cryptarum* than the controls, presumably on account of the neutralizing action of the lime on the tannin [ibid., xiv, p. 543] which normally repels wood-destroying organisms or confines them to the sapwood.

Discussing the practical conclusions arising out of these studies, the writer points out that it is against the access of moisture, not of lime, to structural materials that precautions should be taken in building. Only in the case of oak may lime infiltrations lessen resistance to fungal decay.

McLachlan (T.). **Influence of calcium in the decay of wood.**—*J. Soc. chem. Ind., Lond.*, lv, 17, p. 329, 1936.

The writer obtained from Dr. Rudge pure cultures of *Fomes annosus*, *Lentinus lepideus*, *Polystictus versicolor*, and *Coniophora cerebella* [*C. puteana*], and grew them on calcium carbonate-malt agar with an original hydrogen-ion concentration of P_H 7·5, which is rapidly changed by the organisms to P_H 3·5 or 4. Modern concretes, cements, and lime-washes are stated to contain less free lime (which in contrast to calcium carbonate exerts an inhibitory effect on most wood-destroying fungi) [see preceding abstract] than formerly, hence their failure to repel decay.

Schmidt (E.). **La conservation du bois.** [Wood preservation.]—*Nature, Paris, 1936*, 2975, pp. 362–363, 1936.

In connexion with a summary of some modern developments in wood preservation against fungal decay and fire, the writer mentions that interesting results have been obtained from the experimental use in northern countries, especially the U.S.S.R., of the naphthenates of copper or zinc in solution in organic solvents. Attention is drawn to the corrosive action on metal fittings of the hydrochloric acid formed by the decomposition of zinc chloride. Excellent protection is stated to be given by a mixture of potassium bichromate, sodium arsenate, sodium fluoride, and dinitrophenol, in which the fluoride constituent primarily confers the property of toxicity and the arsenate that of insolubility [cf. *R.A.M.*, xv, p. 333]. By the new osmotic process of impregnation [ibid., xv, p. 546] it has been found possible to penetrate pine-wood to a depth of 50 to 70 mm., so that the heartwood is reached, instead of only to 5 or 10 mm. as by ordinary methods.

BUCKMAN (S. J.). **Creosote distribution in treated wood.**—*Industr. Engng Chem.*, xxviii, 4, pp. 474–480, 2 graphs, 1936.

The distribution of creosote in the sapwood of 21 freshly treated southern yellow pine [*Pinus palustris*] poles was studied at the American Creosoting Company Research Laboratory, Louisville, Kentucky, and determinations made of the amounts of wood substance, water, creosote, and air space present in the spring and summer wood portions of 159 annual rings from 11 poles.

Taking the creosote concentration in the outer ½ in. of sapwood as 100 per cent., the average distribution of the substance in 19 poles was such that the amounts in successive layers, ½ in. in thickness, were 80, 53, 35, and 22 per cent., respectively. In most of the annual rings investigated the creosote concentration was higher in the spring than in the summer wood, the latter offering relatively little accommodation. In certain cases, however, this disadvantage appeared to be offset by the greater facility of penetration of the summer wood, which occasionally resulted in large accumulations of creosote. The observed differences in the amount of air space in the treated spring and summer wood are discussed as a possible factor in 'bleeding' [*R.A.M.*, xv, p. 270].

ENGLUND (B.). **Mögel i våt pappersmassa.** [Mildew in wet pulp.]—*Papp. Trävarutidskr. Finl.*, xvii, 24, pp. 1098, 1100, 1102, 1104, 1106–1108, 8 figs., 1935; xviii, 1, pp. 24, 26–30, 31–32, 9 figs., 1936. [English summary.]

Of recent years mildew and rot in wet pulp are stated to have become increasingly troublesome in the paper trade, and some general observations are made on the various defects due to these sources and on the possibilities of control, with special reference to the work of Kress and collaborators in the United States [*R.A.M.*, iv, p. 644], Håkon and Bade in Norway [ibid., xiv, p. 545], Melin and Nannfeldt in Sweden [ibid., xiv, p. 274], and Levón in Finland [ibid., xiv, p. 729].

PALÉN (A. G. P.). **Arsenikföreningar som träimpregneringsmedel.** [Arsenic compounds as wood preservatives.]—*Tekn. Tidskr.*, lxvi, 11 (*Kemi*, 3), pp. 17–23, 5 figs., 2 graphs, 1936.

A detailed account is given of experiments at a Swedish mining concern on the action of arsenites, especially zinc, and arsenates, including calcium, magnesium, barium, manganese, copper, and zinc, on wood-destroying fungi [cf. *R.A.M.*, xv, p. 414], the extent of infection by *Coniophora cerebella* [*C. puteana*], *Merulius lacrymans*, and *Lentinus squamosus* being measured by loss of weight in the impregnated blocks. Manganese and barium arsenates gave the best results when impregnated test blocks were exposed to the action of running water, while zinc and copper were also satisfactory. Marked resistance to leaching out is usually obtained when the wood is first treated with a solution containing a soluble alkali arsenate and then with one of a soluble salt of the metal to secure precipitation of the metal arsenate in the wood substance.

The arsenates used all gave very good results. The optimum concentration varied with the organisms but averaged 0·1 per cent. or less

of arsenic pentoxide to the dry wood substance. Calcium and zinc arsenates are the most advantageous from the financial standpoint, but the former should only be used in dry situations.

ULJANOV (P. N.). **Drying and sterilizing wood and other structural materials with infra-red rays.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., iv, 8–9, pp. 327–332, 4 graphs, 1935. [Received April, 1936.]

In an investigation carried out by Mme E. Nazarova and the author and referred to in this paper, it was found that *Merulius lacrymans*, *Poria vaporaria*, and *Coniophora cerebella* [*C. puteana*] on wood blocks were completely destroyed in 24 hours by exposure to infra-red rays with a maximum energy at $\lambda = 2{\cdot}78\,\mu$ of a power of $9{\cdot}0$–$11{\cdot}0.10^7$ erg/(cm.^{2} sec.), the temperature at the surface of the blocks reaching 92° to 100° C., that of the reverse side being only 27° to 47°. In a comparative test of the sterilizing effect of heat maintained at 93° to 105° during the same period the results showed that heat proved lethal to the extent of 40 to 50 per cent. Infra-red rays of the same power and period of exposure, having their maximum energy at $\lambda = 1{\cdot}8\,\mu$ and $\lambda = 4{\cdot}3\,\mu$ gave lethal effects of only 75 per cent. and 30 per cent., respectively. It is evident from these data that in the sterilizing action of the infra-red rays on wood-rotting fungi the effect of the heat was merely to increase the electro-magnetic biological action of the rays themselves. [A fuller, but preliminary account of their work is published by Mme E. Nazarova in *Микробиол*, [*Microbiol.*], v, 1, pp. 59–65, 1 graph, 1936. (English summary.)]

FEDORINTCHIK (N. S.). Агротехника в борьбе с почвенными организмами, паразитирующими на растениях. [Agricultural methods for the control of soil-inhabiting organisms, parasitic on plants.]—*Pl. Prot. Leningr.*, *1935*, 5, pp. 61–66, 1935. [English summary. Received May, 1936.]

Continuing his studies on cabbage club root (*Plasmodiophora brassicae*) [*R.A.M.*, xv, p. 475], the author states that the results of pot experiments in 1934 showed that soil taken from a field which had not been sown to crucifers for seven consecutive years still contained sufficient viable spores of *P. brassicae* to infect 26·6 per cent. of the aseptically grown cabbage seedlings that were planted in it, as against 81·2 per cent. infection in soil which carried diseased cabbages the previous year. Further tests showed that in a cabbage field rested for three years the viability of the *P. brassicae* spores was reduced to 43·7 per cent. and in one rested for five years to 40·0 per cent. In fields ploughed two or three times a year no diminution in the percentage germinability of the spores was found at depths varying from 5 to 30 cm., while in fields left unploughed for a year the soil taken at depths of 5 to 10, 15 to 20, 25 to 30, and 30 to 35 cm. gave 84·6, 77·0, 38·5, and 0·0 per cent. infection, respectively, of the cabbage seedlings planted in it. The investigations also showed that intensity of attack by the parasite is directly correlated with the number of viable spores in the soil, 300,000 spores and over per c.c. determining type 4, 10,000 spores type 2, and fewer spores type 1 infection [loc. cit.]. The findings are considered to indicate that crop rotation with cruciferous crops recurring every fourth year,

with grass or clovers during the last two years to avoid ploughing, should be sufficient to give commercial control of club root. Subsidiary tests showed that earthworms are actively concerned in the dissemination of *P. brassicae*, spores passing through the alimentary canal of the earthworm without injury.

BUBENTZOFF (S. T.). Мульчирование в борьбе с болезнями овощных культур. [Mulching in the control of diseases of truck crops.]—*Pl. Prot. Leningr.*, *1935*, 4, pp. 107–110, 1935. [English summary. Received May, 1936.]

Field experiments in 1934 in the Leningrad region showed that mulching the soil with paper (in strips as wide as the rows permit) reduced the loss in mature cauliflowers due to black leg (chiefly caused by *Moniliopsis aderholdi* [*R.A.M.*, xiv, p. 278; xv, p. 452] and more rarely by *Pythium de Baryanum*) from 37·2 to 14·4 per cent. in plots fertilized with stable manure, from 35·6 to 11·9 per cent. in plots that had received mineral fertilizers, and from 33·8 to 15·3 in non-fertilized plots. This reduction was probably due to the growth-stimulating effect of mulching on the plants, which allowed them to escape infection in the seedling stage, when they are most susceptible to the disease.

LUND (A.). **Undersøgelser over Kaalroeforraadnelsen i 1934, foraarsaget af Bakterieangreb.** [Investigations on Swede rot in 1934 caused by bacterial infection.]—*Tidsskr. Planteavl*, xli, 2, pp. 323–336, 4 figs., 1936. [English summary.]

Swede turnips in Denmark suffered heavy damage both in the field and in storage during 1934 from a bacterial root disease [cf. *R.A.M.*, xv, p. 73] developing as a sequel to infestation by *Brevicoryne brassicae* and *Contarinia nasturtii*. Infection began at the root collar and spread downwards, producing a greyish-brown rot. A characteristic dark zone usually marked the line of separation between the diseased and healthy tissues. A green-fluorescent bacterium isolated from the infected material induced the typical symptoms of the rot in inoculation tests on swedes in the field and on excised portions of root, from which the organism was easily reisolated. On the other hand, seedlings three weeks old in pots were not attacked.

From a consideration of the morphological and cultural characters of the swede bacterium it would seem to be identical with *Bacillus brassicaevorus*, reported on cauliflower from France [ibid., vi, p. 330]. The latter organism, however, has not been fully described, so that an exact determination of its relationship with the Danish organism cannot be made. The swede pathogen is believed to occur normally as a saprophyte in the soil, penetrating the roots of the host through wounds made by insects and behaving within the tissues as a facultative parasite.

The Wilhelmsburg variety appears to be a good deal more resistant to the bacterial rot than Bangholm. Losses in storage might be substantially reduced by careful selection before transferring the swedes from the field to the pits.

Hanley (F.) & Mann (J. C.). **The control of heart rot in Sugar-Beet.**—*J. Minist. Agric.*, xliii, 1, pp. 15–23, 3 figs., 1936.

During the wet years 1930 and 1931 heart rot of sugar beets [*R.A.M.*, xv, p. 551] was uncommon in the eastern counties of England, but the three successive dry seasons, from 1933 to 1935, favoured the development of the disease.

On 21st March, 1935, applications of 0, 4, 14, and 28 lb. borax were given to part of a field that had suffered severely a year before, each treatment being replicated four times on $\frac{1}{40}$ acre plots arranged in a Latin square. The beets were sown on 12th April and no serious trouble was experienced until late July. On 21st August the plots showed, respectively, 51·2, 42·5, 6·1, and 5·9 per cent. heart rot. With the onset of showery weather in September, the affected beets put out new shoots; one half of each plot was lifted on 30th September, leaving the remainder to be lifted on 18th November. At the first lifting the plots yielded, respectively, 5·3, 5·6, 6·5, and 6·7 tons of washed beet per acre with sugar percentages in the roots of 14·5, 15, 15·6, and 16, the corresponding figures for the second lifting being 6·2, 6·7, 7·7, and 8·2 tons and 14·3, 14·9, 16·1, and 16·4 per cent. sugar. The results suggest, however, that the 14 lb. per acre application was not quite sufficient, and applications are recommended at the rate of about 21 lb. per acre, which would cost approximately 2*s.* 9*d.* The general inclusion of borax in compound fertilizers is not advised, and it should be used mixed with sand or dry soil and only on fields known to produce diseased crops.

Furneaux (B. S.) & Glasscock (H. H.). **Soils in relation to marsh spot of Pea seed.**—*J. agric. Sci.*, xxvi, 1, pp. 59–84, 3 figs., 1 map, 1936.

A detailed survey of the soils of 165 fields in Kent in which peas were being grown on a commercial scale showed that the occurrence of marsh spot [*R.A.M.*, xiv, pp. 279, 280] was correlated with the presence of a high water-table, incidence being great only in fields with a water-table within 52 in. of the surface. In these conditions a maximum of 100 per cent. of the seeds was affected, whereas in their absence the maximum was only 3 per cent. With some exceptions light and heavy soil texture was correlated with the least and highest average incidence, respectively, the effect of texture upon water movement in the soil probably accounting for the difference. High percentages of marsh spot were observed in two very dry seasons. The evidence obtained clearly demonstrated that occurrence is entirely unconnected with a protracted growing period, contact of pods with the ground, the presence of common salt in the soil, deficiency of available potash and phosphates, and cropping system; potash applications were useless in a very dry season.

Pethybridge (G. H.). **Marsh spot in Pea seeds: is it a deficiency disease?**—*J. Minist. Agric.*, xliii, 1, pp. 55–58, 1936.

After pointing out that owing to important deviations it is not safe to conclude that water-table and soil texture factors themselves cause marsh spot of peas [see preceding abstract], though they may be contributing agents, the author states that no method of preventing the disease on certain soils has yet been discovered. In one locality in which the

trouble has become increasingly serious in recent years oats in close proximity to the peas were found to be affected by grey speck due to deficiency or non-availability of manganese [*R.A.M.*, xv, p. 356]. Two groups of the pea rows (Prestige, Gradus, and Quite Content varieties) opposite the oats, one near the top of the sloping field, the other about 100 yds. lower down, were selected, one half of each row being twice treated with 1½ oz. manganese sulphate dissolved in 20 galls. water, with an interval of one week in mid-June, the other half being left untreated. On 16th July no differences were apparent between the treated and untreated plants. Examination in due course of 100 seeds from each half-row (three being omitted) showed that in the group from the top of the hill the greatest and least reductions in the disease in the treated rows were 67 and 6 per cent., respectively, as compared with the controls, the corresponding figures for the group at the bottom of the hill being 43 and 15 per cent. In every case the percentage of affected seeds was less in the treated than in the untreated plots. It is provisionally concluded that manganese deficiency may have some connexion with the disease.

Pugsley (A. T.). **Halo blight of Beans—some relationships of the pathogen.**—*J. Aust. Inst. agric. Sci.*, ii, 1, pp. 30–31, 1936.

Evidence is adduced showing that the green fluorescent bacteria *Phytomonas* [*Bacterium*] *medicaginis phaseolicola*, *P.* [*Bact.*] *mori*, and an unnamed bacterium pathogenic to stock (*Matthiola*) [*R.A.M.*, xv, p. 191] possess a closely similar, if not identical, heat-labile antigen, whilst the first-named possesses also a heat-stable antigen not shared by the other two; correlated with the latter characteristic was sensitivity to bacteriophage. Inoculations showed that pathogenicity of these organisms is limited to their original hosts.

Bremer (H.). **Zur Epidemiologie und Bekämpfung des Spargelrostes.** [On the epidemiology and control of Asparagus rust.]—*Gartenbauwiss.*, x, 1, pp. 51–73, 4 figs., 1 graph, 1936.

During the four successive winters since 1931 the writer has microscopically examined a large number of collections of asparagus rust (*Puccinia asparagi*) [*R.A.M.*, xv, p. 192] teleutospores overwintering in the open in Germany, with the result that only about a quarter of the total were found to be still viable at the time of primary infection in May. As already shown by Gassner and Hassebrauk [ibid., xiii, p. 677], teleutospores buried in the soil are more likely to survive the winter than those lying on the surface. While living within the temperature range from 7° to 30° C. and relative atmospheric humidity between 27 and 100 per cent. the longevity of the teleutospores is protracted in cool, dry surroundings. No obvious damage was inflicted on these organs by three weeks' exposure to extreme cold (—3° to —20°) or by daily alternations of temperature from —6° to +11° for two to three weeks. No correlation could be detected, moreover, between the meteorological conditions prevailing before and during the period of primary infection and the establishment of asparagus rust epidemics. On the other hand, the spread of the disease appears to be favoured by a hot, dry summer.

Attention has already been drawn [loc. cit.] to the need for the limita-

tion of new plantings as one of the most important means of combating *P. asparagi*, and the writer also stresses this aspect of the control problem. In two years' varietal reaction experiments the American rust-resistant Martha and Mary Washington tended to contract the disease later and more mildly than the other German and foreign sorts tested.

JOËSSEL (P. H.). **Essais de traitements contre les maladies du Melon en 1934.** [Experiments with treatments against Melon diseases in 1934.]—*Ann. Epiphyt.*, N.S., i, pp. 81–101, 5 graphs, 1936.

In further spraying tests against powdery mildew (*Erysiphe cichoracearum*) [*R.A.M.*, xiii, p. 419] and anthracnose (*Colletotrichum lagenarium*) [ibid., xiv, p. 426] carried out near Avignon, Canteloup Charentais melons after receiving a general-purpose application of 1 per cent. copper oxychloride on 29th June were treated with (1) alkaline Bordeaux mixture (1 kg. copper sulphate and 700 gm. caseinated lime per 100 l. water), (2) lime-sulphur, (3) the Bordeaux mixture plus the lime-sulphur, (4) copper oxychloride, (5) permanganate of potassium and lime, and (6) lime solution.

Bordeaux mixture gave good results against both powdery mildew and anthracnose, and melons of maximum commercial value were obtained during the whole period of output, the profit from the treatment amounting to Fr. 1,845 per hect. Almost equally good results were given by Bordeaux mixture and lime-sulphur together. The next best (though much inferior) result was given by lime-sulphur.

LABROUSSE (F.). **Les maladies verticilliennes du Champignon de couche. (Première note.)** [*Verticillium* diseases of the edible Mushroom. (First note.)]—*Rev. Path. vég.*, xxiii, 2, pp. 162–172, 2 pl., 1 fig., 1936.

After referring to earlier investigations on the disease of edible mushrooms [*Psalliota campestris*] caused by *Mycogone perniciosa* [*R.A.M.*, xiv, pp. 554, 739] the author states that in his experiments he invariably obtained direct infection of the sporophores of *P. campestris* by *M. perniciosa*, the resulting symptoms varying with the stage at which infection took place [cf. ibid., ix, p. 429]. No parasitic relationship was observed, however, between *M. perniciosa* and the actively growing mycelium of *P. campestris* [ibid., iv, p. 167], the almost immediate death of the latter at points in contact with germinating spores of *M. perniciosa* being due to a form of hyper-susceptibility, the parasite then existing purely saprophytically on the killed mycelium. The author also records the occurrence of the parasite on *Panaeolus campanulatus* and various species of *Coprinus* growing in mushroom-beds in France.

BOSC (M.). **Bouillies cupriques au sulfate d'ammoniaque.** [Cupric mixtures with ammonium sulphate.]—*Prog. agric. vitic.*, liii, 16, pp. 370–375, 1936.

Highly satisfactory results were again obtained by French vintners in 1935 by the use of ammonium sulphate with cupric sprays for the control of *Plasmopara* [*viticola*: *R.A.M.*, xiv, p. 814], and in general the replies to a *questionnaire* concerning various features of these mixtures, e.g., adhesiveness, wettability, absence of serious scorching of the

foliage, and delayed shedding of the leaves, were favourable. To a mixture consisting of 2 to 3 kg. copper sulphate, 1·5 to 2·5 kg. lime or 1·5 to 2 kg. carbonate of soda, and 100 l. water should be added 300 to 400 gm. ammonium sulphate, this amount being subsequently increased to 700 to 800 gm. (or 1 kg. in cases of actual invasion by the fungus).

SCHNEIDERS (E.). **Beobachtungen und Untersuchungen über die Reisigkrankheit der Reben (Rebenmüdigkeit).** [Observations and investigations on the 'reisig' disease of Vines (Vine exhaustion).] —*Gartenbauwiss.*, x, 1, pp. 110–150, 9 figs., 1936.

The formation of double nodes on vine shoots is considered to be a most important diagnostic feature of the 'reisig' disease [*R.A.M.*, xv, p. 479], occurring as it does before any other symptoms of the disturbance, such as loss of vigour and decline of fertility, and being obvious to the vintner at the time of pruning. The process has been observed to follow an absolutely systematic course and the tendency to double node production, like the occurrence of intracellular cordons (the typical internal indication of 'reisig'), is transmissible by cuttings, grafts, and seeds.

The following stages of the disease may be roughly differentiated. (1) A few years after the absorption of the infective principle [ibid., xiii, p. 492] from the soil, the plants display a deepening of the foliar indentations with marked asymmetry of the petiolar sinuses. (2) From the fifth to the tenth year after contracting infection the vines begin to form double nodes, with a short internode [court-noué] following the node without tendrils. (3) At this stage the racemes are irregularly placed and the berries loose, there is a tendency to pallor of the veins, leaf roll, and premature discoloration. (4) Under adverse conditions or with advancing age the vines show an extensive accumulation of intracellular cordons coinciding with an early arrest of development, shedding of the flowers, a yellowish-green mottling of the leaves, poor and delayed root regeneration, and retarded unfurling of the shoots and maturation of the wood. (5) Progressive deterioration ensues, combined with abundant sucker formation and (in Riesling and Elbling) 'parsley' leaves. (6) The final phase is marked by stunting, shortening of the nodes, and leaves with strikingly deep lobes and pointed teeth or asymmetrical and entirely deformed.

Up to and including the third of the above-mentioned stages the 'reisig' disease may be successfully combated by appropriate cultural measures designed to ameliorate the conditions favourable to the infective principle, including early and late frosts, defective aeration in the root-collar region, stagnant moisture, root rot, and the like. The 'reisig' pathogen remains entirely passive in the vines unless it is stimulated to activity by the weakening of the host through uncongenial surroundings. The disease is definitely a constitutional one and in no sense a mere expression of physiological degeneration. It is widely distributed in all vine-growing countries but assumes economic importance only where neglect or cultural anomalies predispose the plants to infection.

The concluding section of the paper deals at some length with various troubles liable to confusion with 'reisig', e.g., nutritional deficiencies, 'leaf fringe' or 'fan leaf' disease, and the complex of stem diseases

inaptly known as 'pith disease' associated with *Pumilus medullae* and other fungi [ibid., xv, p. 554]. The extremely rare 'leaf fringe' or 'fan leaf' has been erroneously identified with 'roncet'. The fringed leaves are mostly formed in the summer only on one or a few shoots. The internodes are of uniform length and the occurrence of intracellular cordons is not a consistent feature of the disturbance which, unlike 'reisig', does not appear to be transmissible by cuttings or grafts. Under the comprehensive term of 'roncet' must be understood the final stages of the 'reisig' disease as described above.

GIOELLI (F.). **Osservazioni sul 'Pumilus medullae' V. e M.** [Observations on *Pumilus medullae* V. & M.]—*Riv. Pat. veg.*, xxvi, 3–4, pp. 85–87, 1936.

In this paper the author describes an infection of the branches of 5- to 6-year-old vines growing in Padua by *Pumilus medullae* [see preceding abstract]. At the point of grafting the trunks showed a conspicuous swelling which was less marked higher up. The bark was scarred by deep cracks the edges of which bore numerous brown tubercles arranged linearly. Part of the medulla and wood was brown and contained dark brown, septate hyphae approximately 4 μ in diameter. The tubercles along the cracks contained cavities, full of ovoid, colourless stylospores averaging 12 by 4 μ, resembling the spermogonia described by Viala and Marsais [ibid., xiii, p. 680]; no sclerotia, pycnidia, or perithecia were observed.

In culture the fungus gave rise to a dark brown mycelium with two kinds of hyphae, one about 5 μ in diameter and the other narrower, both kinds occurring together. This is stated to be the first record of the disease in Italy.

BRANAS (J.) & BERNON (G.). **Seconde contribution à l'étude du court-noué de la Vigne.** [A second contribution to the study of court-noué of the Vine.]—*Ann. Éc. Agric. Montpellier*, N.S., xxiv, 1, pp. 15–56, 2 figs., 1936.

In an investigation of the relationship between the amount and distribution of tannic substances present in vine shoots and the manifestation of court-noué symptoms [*R.A.M.*, xiv, p. 616; xv, p. 554] the authors differentiate between nine different forms of disease that from time to time have been loosely referred to by various workers as court-noué, viz., that originally studied by Ravaz in 1899, and also investigated by Petri, Pantanelli, and Ranghiano; that due to frost; a special type associated with weakness of the host [ibid., ix, p. 578]; the form known as 'acariosis'; that associated with *Pumilus medullae* [see preceding abstract], to which 'Markkrankheit' is probably related; Californian little leaf [ibid., xiv, p. 768]; a form, showing the presence of endocellular cordons, found in the south-west of France; reisigkrankheit [see preceding page]; and anthracnose deformée [ibid., xiv, p. 77] found on the Pauline hybrid. Of these only the first provided the material for the experiments [the technique of which is described in detail].

The results obtained [which are tabulated] showed that under the conditions of the experiment the organs of vines affected with court-noué contained a greater amount of tannins than the corresponding

parts of healthy vines, the ratio varying from 1·60 to 2·03 for fruiting branches and buds of Aramon and reaching as much as 3·12 for Riparia Gloire de Montpellier.

VIALA (P.) & MARSAIS (P.). **Nouvelles observations relatives à la maladie de la moelle (court-noué parasitaire).** [New observations on the pith disease (parasitic court-noué).]—*Rev. Vitic.*, lxxxiv, 2176, pp. 170–171, 1936.

The writers briefly resume their arguments in favour of the parasitic nature of court-noué of the vine, which they attribute to the attacks of *Pumilus medullae* [see preceding and next abstracts], and claim that confirmatory evidence in support of their hypothesis has been received from Rumania, Austria, and the U.S.S.R. In Languedoc good results are stated to have been obtained by arsenical treatments in the form of painting or spraying after pruning; here and in Charente and Champagne the ravages of the disease are of an alarming character.

MARSAIS (P.). **Les causes de depérissement des Vignes.** [The causes of dying-off of Vines.]—*Rev. Vitic.*, lxxxiv, 2180, pp. 237–242, 1936.

Among the reasons assigned for the gradual dying-off of the vines (involving losses of up to 15 per cent. in the yield of vineyards in Languedoc, Charente, Champagne, and Alsace) are infection by *Pumilus medullae* [see preceding abstracts], *Stereum necator* [*R.A.M.*, xii, p. 486], chlorosis [ibid., xiv, p. 214], defective unions between stock and scion in grafting, and the establishment of vineyards on sites previously occupied by vines. Control measures based on soil sanitation, rational cultural practices, and fungicidal treatments are briefly outlined.

SCHANDERL (H.). **Untersuchungen über die systematische Stellung und die Physiologie des Kellerschimmels Rhacodium cellare Persoon.** [Investigations on the systematic position and the physiology of the cellar mould *Rhacodium cellare* Persoon.]—*Zbl. Bakt.*, Abt. 2, xciv, 5–8, pp. 112–127, 8 figs., 1936.

The salient features in the writer's researches on the taxonomy and physiology of the cellar mould, *Rhacodium cellare*, resulting in its transference to *Cladosporium* as *C. cellare*, have already been noticed from another source [*R.A.M.*, xv, p. 479].

CONNERS (I. L.). **Fifteenth Annual Report of the Canadian Plant Disease Survey, 1935.**—ix+76 pp., 1936. [Mimeographed.]

In this report, which is on the same lines as those of previous years [cf. *R.A.M.*, xiv, p. 494], it is stated that in 1935 wheat stem rust (*Puccinia graminis*) appeared in epidemic proportions in Manitoba and Saskatchewan, and in western Canada the epidemic was the worst ever recorded. The disease appeared in southern Manitoba about 1st July, and spread was so exceedingly rapid that by 25th July infections on common wheat ranged from 75 to 100 per cent. throughout all Manitoba south of the Riding mountains. In this area about 50 per cent. of the wheat was not harvested, and in parts of the south-west of the province under 5 per cent. of the bread wheat was threshed. The average yield of the common wheats in Manitoba amounted to only

about 4 bush. per acre and the total loss caused by the disease was estimated at $85,000,000. The rust-resistant variety Renown produced at the Dominion Rust Research Laboratory, Winnipeg, remained practically unaffected, while Thatcher, developed at St. Paul, Minnesota, was only very lightly rusted, and the use of these varieties, now about to be distributed, should largely eliminate the losses from rust.

Among the many other records of interest may be mentioned *Stagonospora meliloti* causing leaf spot or stem canker on lucerne, alsike clover [*Trifolium hybridum*], and sweet clover [*Melilotus*]; *Armillaria mellea* on mangolds in New Brunswick, apparently responsible for stunting of the plants; bacterial blight (*Phytomonas glycinea*) [*Bacterium glycineum*: ibid., xiii, p. 210] on soy-bean in Quebec, Ontario, and Saskatchewan; curly top of bean [*Phaseolus vulgaris*: ibid., xiv, p. 339] and soy-bean in British Columbia; bacterial rot of celery (*Pseudomonas* [*Bact.*] *fluorescens*) [ibid., xiv, p. 16] destroying an entire stock in storage in Ontario; *Gymnosporangium clavipes* [syn. *G. germinale*: ibid., xv, p. 159] on apple in Quebec and Nova Scotia; *Sclerotium tuliparum* on tulip [ibid., xiii, p. 493] in Ontario; and the following new records for Canada: *Uromyces betae* on sugar beets, garden beets, and mangolds, *Macrosporium carotae* on carrots [ibid., xiv, p. 560], *Peronospora manshurica* on soy-bean [ibid., xiii, p. 656], *P. meliloti* on sweet clover, a seedling-infecting loose smut of barley caused by a fungus closely resembling *Ustilago medians* [ibid., xiv, p. 353], and *Uromyces geranii* on geraniums.

THOMPSON (A.). **The Division of Mycology.**—*Rep. Dep. Agric. Malaya, 1935*, pp. 64–66, 1936.

In this report [cf. *R.A.M.*, xv, p. 78] it is stated that *Fomes lamaensis* caused a saprophytic decay of old leaf bases of oil palms. *Ganoderma lucidum* was isolated from a root disease affecting about 50 coco-nut palms [ibid., xv, p. 436]. *Pythium complectens* [cf. ibid., viii, p. 674] was associated with *Sphaerostilbe repens*, and an unidentified *Pythium* with *Rosellinia* (? *bunodes*) [see below, p. 686] and *Ustulina zonata* in root diseases of tea seed-bearers. A leaf disease of Arabian coffee previously unrecorded in Malaya was caused by *Rhizoctonia* [*Corticium*] *solani* [ibid., xii, p. 760]; the infection occurred during wet weather on bushes grown under shade. Unmanured tuba plants [*Derris elliptica*] growing in exhausted soil showed a die-back due to root disease caused by *R. bataticola* [*Macrophomina phaseoli*: ibid., xv, p. 577]. In wet weather *Choanephora cucurbitarum* [ibid., xv, p. 280] infected the lower leaves of cassava. Tomato fruits and plants were badly attacked by *Phytophthora infestans* [ibid., xv, pp. 79, 111]. Leaf diseases and blackening of the grain of rice were caused by *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: ibid., xiv, p. 653] and *Nigrospora sphaerica* [ibid., vi, p. 758].

A list of the diseases of cultivated plants in Ceylon.—*Bull. Dep. Agric. Ceylon* 88, 47 pp., 1936.

A list, arranged alphabetically under the scientific names of the hosts, is given of the fungal, bacterial, algal, physiological, and virus diseases known up to March, 1935, to affect cultivated plants in Ceylon,

with an appendix on those caused by nematodes. Glossaries of the English and Tamil names of the plants, with their botanical equivalents, are also furnished.

McDonald (J.). **A revised list of plant diseases in Kenya Colony.**—*E. Afr. agric. J.*, i, 6, pp. 463–468, 1936.

This revised list of the plant diseases present in Kenya Colony incorporates the many new records made since the original list was prepared in 1929 [*R.A.M.*, ix, p. 272], and is believed to be a complete survey up to February, 1936.

Department of Botany.—*Rep. Ind. agric. Exp. Sta. 1934–35*, pp. 23–27, 5 figs., [? 1936].

Selections made in Indiana from the cross Chinese wheat×rye were highly resistant to stem and leaf rust of wheat [*Puccinia graminis* and *P. triticina*], leaf rust of rye [*P. secalina*], and wheat powdery mildew [*Erysiphe graminis*]. Hybrids from crosses of high quality wheat resistant to leaf rust with the Hussar and Hungarian varieties were highly resistant to 11 strains of bunt [*Tilletia foetens*] from various localities [*R.A.M.*, xv, p. 344].

Of the physiologic forms of *P. triticina* [ibid., xv, p. 492] occurring in the eastern soft red winter wheat areas in 1934 form 15 was predominant, followed by 9 and 55 (21 collections each), 44 (12), and 2, 5, 31, 56, 61, and 62 (infrequent).

During the year *Phytophthora cactorum* [ibid., xv, pp. 555, 597] was repeatedly isolated from fallen apples lying on the ground, indicating that the fungus is widely distributed in Indiana soils.

Considerable losses were caused by the collar rot phase of tomato early blight [*Alternaria solani*: ibid., xv, p. 406]. Surveys made in the spring of 1935 showed that the disease was epidemic on seedlings in south Indiana and present in most lots of seedlings imported from the southern states. Experimental evidence showed that frequent and thorough spraying with Bordeaux mixture controlled the disease in the presence of abundant inoculum in the soil.

Müller (A. S.). **Brazil: some new records of plant diseases in the State of Minas Geraes.**—*Int. Bull. Pl. Prot.*, x, 5, pp. 98–99, 1936.

A list is given of 27 new phytopathological records from Minas Geraes, Brazil [cf. *R.A.M.*, xiv, pp. 87, 634, 734; xv, pp. 3, 60] including *Cercospora aleuritidis* on *Aleurites fordii*, *C. stevensii* on soybean, *C. zeae-maydis* on maize [ibid., v, p. 252], *Puccinia allii* on onion [ibid., xiv, p. 735], *Bacterium mori* [ibid., xv, p. 191] and *C. moricola* [ibid., xi, p. 475] on mulberry, *Stachylidium theobromae* on Cavendish bananas [ibid., xiv, p. 427], *Corticium salmonicolor* on apple [ibid., xiv, p. 146], and *Phytophthora parasitica* on eggplant [ibid., xiv, pp. 194, 506].

Breed (R. S.) & Conn (H. J.). **The status of the generic term Bacterium Ehrenberg 1828.**—*J. Bact.*, xxxi, 5, pp. 517–518, 1936.

The status of the generic term *Bacterium* is considered to call for rectification by international action in the manner already applied to

that of *Bacillus* [*R.A.M.*, xv, p. 80]. The type species *Bact. triloculare* Ehrenberg 1828 being unrecognizable, later authors have felt free to redefine the genus. However, since none of the new definitions has gained universal approval, it is necessary to state how the term is being used in any given case to avoid confusion. On this account many authors have discarded the term, while others, including the writers, as suggested in an earlier paper [*J. Bact.*, iii, p. 445, 1918], prefer to retain it temporarily to describe such species of non-spore-forming rods as cannot readily be assigned to more clearly defined genera.

RIKER (A. J.). **Biochemical and physical-chemical studies on the bacteria which stimulate atypical and pathological multiplication of plant cells.**—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 107–111, 1936. [French summary.]

The author briefly summarizes recent investigations on the physiology of crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) with special reference to the atypical, pathological cell multiplication involved in its growth [*R.A.M.*, xiv, p. 686; xv, p. 205]. He found that pathogenic and non-pathogenic sister single-cell cultures grown above and below the critical temperature range for pathogenicity on tomato showed no significant differences as regards multiplication in the host or such cultural characters as reduction of nitrates, fermentation of sugars and related substances, carbon dioxide production, cataphoretic velocity, and osmotic pressure and oxidation-reduction potential induced. The gall tissue showed more ash, alkalinity, total nitrogen, oxidizing enzymes, and respiratory activity but less cellulose, starch, pentosans, and reducing sugar than the contiguous healthy tissues. The viscosity of giant colonies grown upon agar media seems at present to be the only bacterial character that is correlated with pathogenicity.

WEST (J.). **Black pod of Cacao. Experimental control on native farms.** —*Eleventh Bull. agric. Dep. Nigeria*, pp. 55–65, 1936.

This paper, describing spraying and dusting experiments carried out in Nigeria from 1931 to 1934 against cacao black pod (*Phytophthora faberi*) [*P. palmivora*], is an expanded account of one already noticed from another source [*R.A.M.*, xiv, p. 217].

HUMPHREY (H. B.). **The development of disease-resistant plants.**—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 267–274, 1936. [French summary.]

After pointing out that in the development of disease-resistant plant varieties many qualities besides resistance must be studied in order to obtain a commercially desirable variety, the author discusses the methods used in this work in the United States, with particular reference to the breeding of wheat varieties showing combined resistance to rusts (*Puccinia* spp.) [*R.A.M.*, xiv, p. 567], bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*: ibid., xv, p. 563], loose smut (*Ustilago tritici*), and *Helminthosporium* foot rot [*H. sativum*], oats resistant to rusts [*Puccinia*] and smuts (*U. avenae* and *U. levis* [*U. kolleri*]) [ibid., xv, p. 434], flax varieties resistant to rust (*Melampsora lini* var. *lini*-

perda) [ibid., x, p. 108], and maize varieties resistant to Stewart's disease (*Aplanobacter stewarti*) [ibid., xv, p. 434] and smut (*Ustilago zeae*).

STAKMAN (E. C.) & HART (HELEN). **The nature of resistance of cereals to rust.**—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 253–266, 1936. [French summary.]

In this discussion of the general principles of the resistance of cereals to rust the authors present evidence for their view that there are at least three well-defined types of resistance of wheats to *Puccinia graminis tritici* and several less well-defined ones, the three former being (*a*) protoplasmic, (*b*) morphological, and (*c*) functional. A wheat variety may possess one type of resistance, or all or any combination of them. All are subject to considerable variation, the degree of variation and the frequency of its occurrence under a reasonably normal range of conditions determining when and to what extent a variety will be resistant.

WATERHOUSE (W. L.). **Presidential address. Some observations on cereal rust problems in Australia.**—*Proc. Linn. Soc. N.S.W.*, lxi, 1–2, pp. v–xxxviii, 1936.

Following a brief introductory sketch of the history of phytopathology, the author illustrates the importance of plant diseases by citing some striking examples of losses from cereal rusts (*Puccinia* spp.) in Australia and other countries, discusses the three factors involved in the causation of the rusts (pathogen, host, and environment), the origin of the fungi concerned in Australia and their seasonal perpetuation, physiologic specialization in *P. graminis tritici* [*R.A.M.*, xiv, p. 618], *P. g. avenae* [ibid., ix, p. 703], *P. triticina* on wheat [ibid., xi, p. 629], *P. coronata avenae* [*P. lolii*] on oats [ibid., xiv, p. 435; xv, p. 571], *P. anomala* on barley [ibid., vii, p. 314], and *P. dispersa* [*P. secalina*] on rye, and control by appropriate sanitary and cultural measures, dusting with sulphur, and breeding for resistance.

HEMMI (T.). **On the distribution of cereal rusts in Japan and the relation of humidity to germination of urediniospores of some species of Puccinia.**—*Proc. fifth Pacif. Sci. Congr., 1933*, iv, pp. 3187–3194, 1935.

Puccinia graminis on wheat, barley, oats, and other grasses, *P. glumarum* on wheat and barley, *P. simplex* [*P. anomala*] on barley, and *P. triticina* on wheat are stated to be distributed throughout the main islands of Japan from Hokkaido to Formosa, whereas *P. dispersa* [*P. secalina*] on rye occurs only in Hokkaido and Honshu. *P. lolii* on oats and *Uromyces setariae-italicae* (Diet.) Yoshino on *Setaria italica* are also widely distributed over the main islands, though the former has not been found in Shikoku or the latter in Hokkaido. *P. purpurea* on *Andropogon sorghum* var. *obovatus* and *Sorghum halepense* [*R.A.M.*, xiv, p. 258] is known only in Kyushu and Formosa. Aecidia of *P. graminis* have been collected on *Berberis vulgaris* but the rust is destructive on wheat and barley even in districts where the alternate host is absent. The very common *Thalictrum minus* var. *elatum* probably

serves to spread *P. triticina* among the wheat crops, at any rate in the north of the country. The work described in the remainder of the paper has already been noticed from another source [ibid., xiii, p. 83].

Barmenkoff (A. S.). Прибор для изучения реакции растения на паразита. [An apparatus for the study of the reaction of plants to parasitic organisms.]—*Pl. Prot. Leningr.*, *1935*, 7, pp. 148–149, 1 fig., 1935. [Received May, 1936.]

The apparatus described in this paper is stated to have been successfully used in 1935 in Russian phytopathological laboratories in studies on the physiological races of brown wheat rust (*Puccinia triticina*), and it is believed that it may also be useful in investigations on the inheritance of rust resistance in cereals. It consists of a closed glass tube, 16 cm. long and 2 cm. in diameter, internally divided by glass partitions into six chambers, each partition being perforated by a central hole, 0·6 cm. in diameter. Each compartment is further provided with a bordered lateral aperture, 1·2 cm. wide. One leaf on a growing cereal plant, after gentle rubbing between the fingers to remove its waxy covering, is threaded through all the holes of the partitions and the tube fixed in position by means of a wooden prop stuck into the ground; the partition holes are then carefully plugged with cotton-wool, so as to isolate the compartments from one another, after which the enclosed leaf sections are each inoculated with the rust form to be tested, and the lateral openings in the tube are also plugged with cotton-wool or a rubber stopper. The apparatus is left thus for a period of time sufficient for the establishment of infection, after which the lateral openings are unplugged and covered with cheesecloth to admit external air to the leaf sections. The apparatus should not be removed before the end of the experiments.

Vanderwalle (R.) & Larose (E.). **La désinfection à l'eau chaude des semences de Froment contre le charbon nu Ustilago nuda tritici Schaf.** [The disinfection of Wheat seed-grain by hot water against loose smut, *Ustilago nuda tritici* Schaf.]—*Bull. Inst. agron. Gembloux*, v, 1, pp. 74–88, 1 fig., 1936. [Flemish, German, and English summaries.]

The following results were obtained in the authors' experiments in the control of loose smut of wheat (*Ustilago tritici*) [*R.A.M.*, xv, pp. 431, 563] by pre-soaking, succeeded by the hot-water treatment proper [cf. ibid., xv, p. 353]. For pre-soaking a period of at least two hours at a minimum temperature of 25° C. was found to be necessary. The maximum benefit was derived from (1) 3½ hours' pre-soaking at 30° followed by 50 minutes at 50°; (2) 3 hours at 25°, 15 minutes at 50°; (3) 2½ hours at 25°, 15 minutes at 52°; and (4) 5 hours at 30°, 15 minutes at 48°. The germinative capacity of the seed-grain was, however, considerably impaired by treatments (2) and (3), and altogether the method is so complicated as virtually to confine its use to research stations and the like. In practice, therefore, the development of new resistant wheat strains is the first step towards a solution of the loose smut problem.

Sidorin (M. I.), Alexandrovskaya (Mme Z. V.), Uspenskaya (Mme M. S.), & Shirokova (Mme Z. N.). Влияние подзимних посевов яровой Пшеницы на зараженность пыльной головней. [Effect of late autumn sowing of spring Wheat on the degree of infection with loose smut.]—*Pl. Prot. Leningr., 1935*, 7, pp. 130–135, 1935. [English summary. Received May, 1936.]

The results of experiments from 1932 to 1934, inclusive, in the region of Moscow showed that when seed-grain of Lutescens 062 spring wheat, naturally infected with loose smut (*Ustilago tritici*), was sown in experimental plots in late autumn (end of November and beginning of December), the resulting crops were entirely free from the smut, while the crops raised from the same seed-grain sown in the following spring showed from 2·1 to 3·2 per cent. infection with the smut. The autumn-sown plants developed more vigorously than spring-sown and gave a slightly better yield.

Buchheim (A. N.). О влиянии проморaживания семян Пшеницы, зараженных пыльной головней, на всхожесть и развитие растений. [Effect of freezing on the germinability of Wheat seeds infected with loose smut, and on the development of the plants raised from them.]—*Pl. Prot. Leningr., 1935*, 6, pp. 134–137, 1935. [Received July, 1936.]

An account is given of experiments in Moscow, in which seed-grain collected from wheat plants artificially inoculated with loose smut [*Ustilago tritici*] the preceding year was soaked for 24 hours in water and then frozen for 6 hours at —6·8° C. before being sown in the spring of 1935. The results showed that the smut-infected grains were not more susceptible than the normal to the action of frost which did not kill the mycelium inside the grains. A slight reduction (57·2 as against 61·8 per cent.) was noticed in the percentage of smutted ears, due to the fact that the plants raised from the treated seed on the average contained 4·5 tillers as against 3·35 in the infected controls.

Becker (T.). **Untersuchungen über Sexualität bei Tilletia tritici (Bjerk.) Wint. im Rahmen der Immunitätszuchtung.** [Studies on sexuality in *Tilletia tritici* (Bjerk.) Wint. in relation to breeding for immunity.]—*Phytopath. Z.*, ix, 2, pp. 187–228, 4 pl., 3 figs., 1 diag., 1936.

Sporidial material of *Tilletia tritici* [*T. caries*] for inoculation experiments was best secured by germinating the spores under artificial illumination, beginning at a temperature of 20° C. and then alternating between 10° and 15°. A full description is given of the improved technique of isolation and culture which facilitated the production of numerous sporidia (up to 12 or 13) from each spore. A strongly heterozygous character was apparent in the growth habit (types of which are illustrated by a number of photographs) of all but one or two of the 275 monosporidial lines examined on a potato sucrose agar medium. Only one spore showed homozygous growth. The rapid provision of a large quantity of inoculum was effected by reducing the proportion of agar from 2 to 1·4 per cent. so that the surface of the

substratum in the Erlenmeyer flasks was partially covered with a layer of moisture. Flor's method of inoculation by introducing the mycelium into the coleoptile [*R.A.M.*, xi, p. 440] gave the most reliable results.

Growth characters did not serve as a means of differentiating the strains. An analysis of the sexual relations in *T. caries* revealed the occurrence of bipolarity within monospore progenies, while a more complex situation was indicated in the case of combinations of haploid lines of various spores of diverse origin. The inheritance of 'aggressiveness' [ibid., ix, p. 120] in tests on the Panzer wheat variety appeared to follow an intermediate and a recessive course, respectively, in two different combinations between the Breslau and Lyngby (Denmark) collections of the fungus. The inheritance of certain growth habits was studied through three monospore generations of *T. caries*, but though the fact of transmission is unquestioned no light was thrown on the manner of its occurrence.

T. levis [*T. foetens*] occurs only occasionally in Germany and single spore isolations showed no difference in growth type from those of *T. caries*.

DENAIFFE, COLLE, & FLANDRIN. **Traitements anticryptogamiques et germination.** [Fungicidal treatments and germination.]—*J. Agric. prat., Paris*, N.S., c, 19, pp. 381–382; 20, pp. 401–403, 4 graphs, 1936.

In a test carried out at an experimental farm attached to a French seed-grain-producing establishment, where between 14,000 and 15,000 germination tests are made each year, wheat samples treated by the ordinary copper sulphate and lime method and subsequently preserved in packets germinated as satisfactorily in the following year as at the time of application. The preparation in most frequent use at the experimental farm is a mixture of copper sulphate and copper acetate, which can safely be employed at a strength of up to 2 per cent. (12 minutes' immersion) or 5 per cent. of the weight of the seed-grain (dusting) without impairing germination. In practice it is probably wiser, however, to use this combination at a concentration of 1 to 1·5 per cent., immersing the seed-grain for 10 minutes and draining immediately afterwards. This treatment is effective against wheat bunt [*Tilletia caries* and *T. foetens*: *R.A.M.*, xi, p. 100].

NIEVES (R.). **Genética de la resistencia a la 'carie' ('Tilletia tritici' raza 5 M.A.), en la cruza Barletta×Florence (Cheg 27–10x).** [Genetics of resistance to bunt (*Tilletia tritici* strain 5 M.A.) in the cross Barletta×Florence (Cheg 27–10x).]—*Physis, B. Aires*, xii, 41, pp. 51–63, 1936.

A tabulated account is given of the writer's studies on the hereditary nature of the character for resistance to bunt (*Tilletia tritici*) [*T. caries*] strain 5 M.A. in the wheat cross Barletta×Florence [*R.A.M.*, xiv, p. 626]. Susceptibility was shown to be dominant, the following principal factors being involved: $S_1S_1S_2S_2$, representing the genotypical constitution of Barletta, that of Florence being expressed by $s_1s_1s_2s_2$. Segregation occurred in the F_3 in the ratio of 9 : 3 : 3 : 1, comprising

9 hypersusceptible lines with 40 to 100 per cent. infection, 3 susceptible (25 to 40), 3 moderately susceptible (10 to 15), and 1 resistant (0 to 10). The abnormally variable response of the plants to infection is attributed partly to the existence within the host of numerous distinct races, and in part to physiologic specialization in the parasite.

NIEVES (R.). **Distribución y prevalencia relativa de la 'Tilletia tritici' y 'Tilletia levis' (caries del Trigo) en la región de Guatraché.** [The distribution and relative prevalence of *Tilletia tritici* and *Tilletia levis* (Wheat bunt) in the Guatraché district.]—*Physis, B. Aires*, xii, 41, pp. 64–70, 1936.

The data here presented on the distribution, relative prevalence, and economic importance of *Tilletia tritici* and *T. levis* [*T. caries* and *T. foetens*] in the wheat-growing centres of La Pampa, Argentine Republic, have already been noticed from another source [*R.A.M.*, xiii, p. 751].

HENRY (A. W.). **The summerfallow in relation to foot-rot diseases of Wheat in Western Canada.**—*Proc. fifth Pacif. Sci. Congr. 1933*, iv, pp. 3205–3209, 1935. [Received June, 1936.]

Observations in Alberta over a period of five years showed that wheat following summer fallow is generally freer from foot rot than that grown after wheat, especially in the drier areas, where take-all (*Ophiobolus graminis*) [*R.A.M.*, xii, p. 622; xv, p. 490] is relatively rare. Brown root rot (*Pythium* spp.) [ibid., xv, p. 432], on the other hand, is distinctly favoured by conditions of the summer fallow.

In experimental plots at the University of Alberta records made in 1932, when foot rot was apparently chiefly due to *Helminthosporium sativum* [loc. cit.], showed that plots sown with wheat continuously gave the lowest yield and highest infection, while the results from wheat following two years of summer fallow were vice versa; the yield differences were, however, probably due in part to seasonal climatic conditions. Take-all was very noticeable in certain plots in 1931 following summer fallow the previous year, the severity of the disease in plots of wheat after wheat being no greater, even if as great. Foot rots of wheat caused by *H. sativum* and possibly certain other fungi may, therefore, be more effectively suppressed by summer fallowing than that caused by *O. graminis*, a conclusion which is stated to be apparently borne out by greenhouse experiments.

MARLAND (A. G.). Влияние почвенных факторов на проявление фузариоза всходов Пшеницы. [The effect of soil factors on the infection of Wheat seedlings by *Fusarium* spp.]—*Pl. Prot. Leningr., 1935*, 6, pp. 99–106, 1935. [Received July, 1936.]

Mycological analysis of wheat field soils (from 1932 to 1934, inclusive) taken from the Leningrad and the Azoff–Black Sea regions showed that while the latter soils contained a greater variety of species of *Fusarium*, the former were richer in species belonging to the section *Discolor*, including species particularly pathogenic to wheat. Most of the *Fusarium* spores were found at depths down to 20 cm., below which

their numbers sharply declined. The pathogenic forms were most abundant at the time when autumn-sown wheats emerged from the soil. In controlled experiments with *F. culmorum* [*R.A.M.*, xv, p. 489] and *F. graminearum* [*Gibberella saubinetii*], which are stated to be the most injurious to wheat crops in north Russia, the optimum temperature for the germination of the spores of the two species was found to be between 21° and 27° C., while temperatures above 32° sharply reduced their viability; at 12° the spores germinated within four hours. Exposure of the spores to temperatures between 4° and 7° for one month did not affect their high virulence to wheat seedlings, while temperatures of 31° and above strongly reduced their pathogenicity. Both species required the presence of liquid water for germination, but in artificial inoculation experiments it was shown that maximum infection of wheat seedlings (Caesium 0111) occurred at relative humidities of 60 to 70 per cent., a reduction occurring at 90 per cent. Wounding of the wheat seedling root system appeared to facilitate infection.

Kholodnyuk (I. K.). К вопросу обеззараживания фузариозных семян Пшеницы. [On the problem of the disinfection of Wheat seed-grain infected by *Fusarium*.]—*Pl. Prot. Leningr.*, *1935*, 7, pp. 119–129, 2 figs., 1935. [English summary. Received May, 1936.]

The results of comparative experiments in 1934 at Kursk and Rostoff-on-Don showed that hot-water treatment (2 hours at 20° C. and 7 mins. at 52° to 55°) of wheat seed-grain (Hordeiforme 010), naturally heavily infected with *Fusarium avenaceum* [see below, p. 643] and other species of this genus, entirely prevented the infection of the seedlings with the fungi, but somewhat reduced the viability of the seed. The best commercial control was given by steeping the seed for 30 minutes in 0·25 germisan (imported), which reduced seedling infection from 13·5 per cent. in the controls to 2·6 per cent. and increased the yield from 3·54 and 4·25 to 5·6 ztr. per ha. [1·41 and 1·69 to 2·23 cwt. per ac.]. Steeping in an ammoniacal solution of 0·1 per cent. mercurized aniline ($C_6H_4NH_2Hg(C_2H_3O_2)$) for 30 minutes completely suppressed seedling infection but only increased the yield to 4·98 ztr. [1·98]. Soviet germisan [*R.A.M.*, xv, p. 519] was almost as good. Immersing the seed-grain in water deprived of its oxygen [cf. ibid., xv, p. 431] or keeping it in oxygen-free atmospheres for various lengths of time gave no control of the fungi and seriously impaired the germinability.

Noll (A.). **Experimentelle Untersuchungen über den Befall des Weizens mit Penicillium.** [Experimental studies on *Penicillium* infection of Wheat.]—*Phytopath. Z.*, ix, 2, pp. 147–186, 6 figs., 1936.

The first symptom of *Penicillium* infection on wheat [*R.A.M.*, xiv, p. 298] appears on the seed-grain. In inoculation tests with one of the six green strains isolated from diseased wheat plants at about 20° C. under normal moisture conditions, pale bluish, later darkening to

greyish-green, fungal masses of felt-like consistency developed three to four days after sowing, chiefly at the periphery of the embryonal integument, and overgrew the basal portions of the seedling. A gradual weakening of the plants followed, manifested in a few cases by early arrest of growth, but in the majority merely by general sickliness and chlorosis.

The unidentified strain of *Penicillium* used in these experiments is characterized by hyphae of very variable structure averaging 6·5 to 7·6 μ in width. The circular, smooth conidia mostly measure 3·8 μ in diameter (minimum 3·3 μ), the cylindrical, apically tapering sterigmata 9·5 by 3·8 μ, and the metulae 13·3 by 6·5 μ. The cultural and physiological characters of the fungus are fully described. A special technique [which is explained in detail] was devised for the inoculation of the seed-grain with a spore suspension of the *Penicillium*. Wounding was found to be essential to infection, which took place even through the minute fissures and cracks sustained in the normal course of threshing operations. The examination in 1934 of 60 seed samples of different varieties from a number of sources showed 6 per cent. *Penicillium* infection on germinating wheat and 13 per cent. on rye. The mould caused considerably more damage at low temperatures, the dry weight of diseased seedlings in relation to healthy ones at 4° C. being some 23 per cent. lower than at 20°. Insufficient moisture in the seed-bed was responsible for increasingly heavy losses—from 17 per cent. at 50 per cent. of saturation to 92 per cent. at 5.

The hyphae of the fungus penetrated the seed between the pericarp and testa and permeated the aleurone layer, whence they migrated singly into the endosperm, covered the epithelium of the scutellum, and finally formed dense coils in the invaded cells. In older plants the parenchyma of the scutellum and the tissues between the haulm and the root were also attacked.

Of the eight standard treatments tested for the control of *Penicillium* infection in wheat, the germisan short disinfection process and immersion in uspulun-universal were the only two with a limited degree of efficacy, reducing the incidence of disease from 100 to 56 and 63 per cent., respectively.

LEUKEL (R. W.). **Further experiments on the control of Barley smuts.**—*Tech. Bull. U.S. Dep. Agric.* 513, 12 pp., 1936.

In further experiments on the control of covered smut (*Ustilago hordei*) and black loose smut (*U. nigra*) [*R.A.M.*, xv, p. 347] of barley both diseases were completely controlled on seed inoculated by the evacuation and dry spore methods [ibid., xv, pp. 431, 567] by ceresan and new improved ceresan dusts [ibid., xv, p. 10 *et passim*], the former applied at the rate of 2 or 3 oz. and the latter at the rate of ½ oz. per bushel of seed. Soaking for 1 hour in a 1 in 320 formaldehyde solution eliminated *U. nigra* and gave fair control of *U. hordei*. Formaldehyde dusts were not consistently effective.

In two consecutive years barley from fields badly infected with *U. hordei* produced crops with very low percentages of smutted heads. Inoculation by the dry spore method gave the better results for *U. nigra* and the evacuation method for *U. hordei*.

Reed (G. M.). **Reports on research for 1935. Plant pathology.**—*Rep. Brooklyn bot. Gdn, 1935* (*Brooklyn bot. Gdn Rec.*, xxv, 2), pp. 45–59, 1936.

Extensive experiments carried out in New York in 1935 to ascertain the influence of the host plant on the development of oat loose and covered smuts (*Ustilago avenae* and *U. kolleri*) [*R.A.M.*, xv, p. 434] following penetration by the parasite showed that there were very decided differences in the rate of growth and development of the host plants dependent on length of daylight, presence of sodium nitrate in the soil, and presence or deficiency of nitrate, potash, and phosphate.

In further studies on the inheritance of resistance of oats to loose and covered smuts 180 F_3 progenies of Hybrid 82 (Danish Island × Monarch) were inoculated with *U. avenae*, the former parent being susceptible to *U. avenae* and resistant to *U. kolleri*, and the latter vice versa. Of the inoculated plants 78 were resistant, 79 segregating, and 23 susceptible. In another series 179 F_3 progenies of the cross were inoculated with *U. kolleri* and showed 1 plant resistant, 64 segregating, and 114 susceptible. Considerable data are also given regarding a number of other hybrids.

Studies by L. G. Utter on the characteristics of *U. avenae* and *U. kolleri* when grown on artificial media showed that neither smut can be separated from the other on a basis of its behaviour in culture; also the physiologic races of these fungi cannot be definitely distinguished by this means. In 1933 combinations of cultures involving 13 single conidial isolations of loose with 3 of covered smut [ibid., xv, p. 570] were used to inoculate Gothland and Monarch oats, the chlamydospores collected from the infected plants being used for further inoculations in 1934, and the process being repeated in 1935; the evidence obtained indicated that through the combination of the original cultures two new types of smut had arisen, a loose smut capable of infecting Monarch, and a covered smut capable of infecting Gothland.

In studies by Miss D. E. Marcy further evidence was obtained from F_2 hybrids that resistance to *Sphacelotheca sorghi* [ibid., xiv, pp. 438, 574] is dominant in Milo crosses and susceptibility in Feterita crosses. On the other hand, susceptibility to *S. cruenta* [loc. cit.] in the Milo hybrids is probably due to a dominant factor and in the Feterita hybrids to a recessive one. The reaction of the hybrids to the two smuts was thus exactly opposite. Of the data regarding the F_3 progenies, it may be mentioned that when progenies of a cross between Feterita and Dwarf Yellow Milo were inoculated with *S. cruenta* no infection resulted, indicating that both varieties contain the same factor or factors for resistance. Experimental evidence demonstrated that the number of infected plants of a susceptible variety inoculated with *S. sorghi* may vary from 0 to 94·1 per cent., dependent upon the environmental conditions prevailing during germination.

Murphy (H. C.), Stanton (T. R.), & Coffman (F. A.). **Hybrid selections of Oats resistant to smuts and rusts.**—*J. Amer. Soc. Agron.*, xxviii, 5, pp. 370–373, 1 fig., 1936.

Further promising results were obtained in respect of resistance to crown and stem [black] rust (*Puccinia coronata* [*P. lolii*] and *P.*

graminis) and loose and covered smuts (*Ustilago avenae* and *U. levis* [*U. kolleri*]) in experiments in Iowa with crosses of Bond (C.I. 733)× Iogold (C.I. 2329), Anthony (C.I. 2143)×Bond, Bond×Iowa No. D69 (C.I. 2463), and Green Russian selection (C.I. 2344)×Bond oats, which have now reached the F_5 generation [*R.A.M.*, xiii, p. 434; xv, p. 571]. The epidemics to which these selections were subjected having been much more severe than those ordinarily occurring in the field, there is believed to be every hope of their continued resistance to both rusts and smuts under normal conditions.

Anliker (J.). **Beiträge zur Kenntnis der Fusariose des Roggens.** [Contributions to the knowledge of Rye fusariosis.]—*Beitr. Kryptogamenfl. Schweiz*, viii, 4, 115 pp., 3 pl., 3 figs., 1 diag., 19 graphs, 1935.

The following fungi, in order of frequency, were isolated from young rye plants in diseased stands in central Switzerland: *Calonectria graminicola*, *Fusarium herbarum* [*F. avenaceum*: *R.A.M.*, xiv, p. 709], *F. solani* var. *martii* [ibid., xiv, p. 613], *F. orthoceras* var. *longius*, *F. merismoides* [ibid., xiv, pp. 123, 653], and *Cylindrocarpon olidum* [ibid., xv, p. 605]; *F. equiseti* and *F. solani* were isolated from rye seed-grain, and *F. sambucinum* [cf. ibid., xiv, p. 409; xv, p. 6] (*Gibberella pulicaris*) from young, diseased wheat plants. The spore dimensions of one of the strains of *Calonectria graminicola* examined were intermediate between those of the type species and those of *C. graminicola* var. *neglecta* [ibid., xiv, p. 297] (*F. nivale* var. *majus*) (triseptate conidia 26 by 4·7 μ, 4- to 5-septate 31·6 by 4·9 μ, and 6- to 7-septate 33·6 by 5·15 μ).

An analysis of the replies to a questionnaire circulated among farmers in the districts covered by the survey revealed complete unanimity in respect of the correlation between virulence of the snow mould and the severity and duration of the snowfall [ibid., xi, p. 777; xii, p. 623]. Very moist soils are generally considered to promote infection, which is further favoured, according to some reports and confirmed by the author's field experiments, by an abundance of humus. The Petkus variety is commonly regarded as more, and Rothenbrunner as less, susceptible than the ordinary local rye. Yield reductions of 20 to 25 per cent. appear to be frequent, while the loss of entire stands is occasionally reported. In general, late sowing (3rd November) increased the losses from snow mould as compared with medium-early (10th October) and early (21st September) planting, but further tests are required to confirm this information. With a few exceptions, treatment of the seed-grain with mercuric chloride increased the yield.

In a culture of *C. graminicola* (Baarn strain) in a modified Richards's solution (without magnesium) the acidity increased from P_H 3·97 to 4·16 to P_H 3·0, whereas a virulent local strain from rye on malt extract of P_H 5·26 modified the reaction in the direction of neutrality.

In pot experiments the symptoms induced by inoculation with *F. avenaceum* were either equally severe throughout the temperature range of 6° to 34° C. or were most in evidence between 25·4° and 33°. In no case, contrary to expectation, was the highest incidence of infection observed at the intermediate and lower temperatures [cf. ibid.,

xiii, p. 719]. On Petkus rye *F. avenaceum* was more injurious in alkaline (P_H 8·80) than in neutral soils (P_H 6·98) [ibid., ix, p. 667]. A particularly vigorous, abundantly sporulating strain isolated from Petkus was much more highly pathogenic in these tests than that from Baarn. The maximum damage by *C. graminicola* (up to 100 per cent.) was inflicted at soil temperatures round about 26°; at 6° to 21° the injury was negligible [ibid., viii, p. 497; x, p. 94]. Under the conditions of these trials Petkus was considerably more resistant than local rye. As in the case of *F. avenaceum*, the effects of *C. graminicola* were most pronounced on alkaline soils.

VILKAITIS (V.). **I. Javų ligos. II. Cukrinių Runkelių ligos.** [I. Cereal diseases. II. Sugar beet diseases.]—Reprinted from *Rep. Pl. Prot. Sta. Dotnuva 1934*, 18 pp., 1936. [English summary.]

The results of experiments in 1934 showed that control of wheat bunt (*Tilletia tritici*) [*T. caries*] by seed dusting was unsatisfactory in soil heavily contaminated with the spores of the fungus. In plots artificially inoculated in the autumn, bunt spores were capable of infecting wheat seedlings for at least one month after inoculation, but seed sown 11 days from inoculation gave a much less bunted crop than that sown immediately, and a similar result was obtained in the spring. Of the six spring wheat varieties tested, Dotnuvos 81 and Heines Kolben showed only 1·27 and 1·41 per cent. bunted ears, respectively. On Lochows Petkus rye sown on the 5th, 11th, 16th, 21st, 26th of September, and 1st October, the degree of infection from brown rust (*Puccinia dispersa*) [*P. secalina*] declined from the first to the last date of sowing in the ratio 99 : 31 : 21 : 14 : 6 : 5. While none of nine rye varieties tested was highly resistant to stripe smut (*Urocystis occulta*), the Vierzbna variety only showed 7·61 per cent. infection; this fungus was shown to be capable of infecting rye seedlings at least four weeks after inoculation of the soil.

Field experiments confirmed the efficacy of applications of borax in the control of heart rot of sugar beet [*R.A.M.*, xv, p. 626].

EDWARDS (E. T.). **Root and basal stalk rot of Maize.**—*Agric. Gaz. N.S.W.*, xlvii, 5, pp. 259–261, 2 figs., 1936.

After describing the symptoms of root and basal stalk rot of maize, which in New South Wales is caused almost invariably by *Gibberella saubinetii* [*R.A.M.*, xi, p. 222; xv, p. 360] and each season causes serious economic losses (25 to 30 per cent. of the plants commonly being affected and sometimes up to 60 to 70 per cent.), the author states that control depends largely on field sanitation. The old stalks should be hoed out, raked up, and burnt as soon as possible; a definite system of rotation should be adopted when practicable, and, though only of secondary importance in control, seed selection should always be carried out as a precautionary measure.

EIDE (C. J.). **The pathogenicity and genetics of Gibberella saubinetii (Mont.) Sacc.**—*Tech. Bull. Minn. agric. Exp. Sta.* 106, 67 pp., 7 pl., 5 figs., 4 graphs, 1935. [Received August, 1936.]

A total of 325 isolations was made from ascospores of *Gibberella*

saubinetii naturally occurring on maize stubble in wheat and barley fields in Minnesota [*R.A.M.*, xiv, p. 749], and compared with a culture originally obtained by Tu from Wisconsin [ibid., x, p. 721] and one from Iowa. All but 31 were of the same cultural type, varying only in degree of colour intensity. Of the 31, 24 resembled the majority on potato dextrose but differed on Coons's agar, which tends to emphasize variations in this fungus, while the remaining seven comprised three types, two represented by one culture each and the third by five from a single collection.

When first isolated from field material, only one of the single ascospore isolations produced perithecia in culture, but in the absence of visible variation (which seemed to involve a loss of the reproductive function) most of them manifested the capacity to do so when grown on oat hulls for a week and then stirred into sterilized sand in pots which were kept thoroughly wet in the greenhouse. In three cases the ability to produce perithecia in culture developed spontaneously in the same manner as other variations. Perithecial variants retain their cultural characters and capacity for perithecial formation when propagated from single ascospores, conidia, or germ-tubes from individual cells of either spore type, indicating that the cultures investigated are homothallic.

Details are given of a special method devised for the detection of minor differences in the pathogenicity of different cultures of the fungus to Rustler and Golden Bantam maize and Prelude, Pentad, and Marquillo wheat seedlings. The seedlings were scored according to the degree of infection represented by 10 and 4 standard types for maize and wheat, respectively, and the figures for 32 and 25 seedlings, respectively, in each replicate were totalled and analysed statistically. Apart from the variants, some of which were less virulent than the parent cultures, no striking differences were observed in the pathogenicity of the ascospore isolations from field material used in these tests.

STOREY (H. H.). **Virus diseases of East African plants. V. Streak disease of Maize.**—*E. Afr. agric. J.*, i, 6, pp. 471–475, 4 figs., 1936.

In this semi-popular account of maize streak, which is reported from many parts of Africa, including Egypt [*R.A.M.*, xv, p. 462], the author states that the secondary effects of the disease depend upon the age at which the plant becomes infected, seedling infection resulting in severe stunting and, usually, a failure to set any seed, whereas plants infected just before flowering show no apparent ill effects; infections at intermediate stages of growth cause malformation of the cobs and stunting of shoot and root growth.

Besides *Cicadulina mbila* and *C. zeae* [ibid., xiv, p. 146], a new vector has been found in East Africa in *C. nicholsi*, which somewhat resembles *C. mbila* but lacks the characteristic white stripe. The symptoms of streak disease are sometimes so similar to those of maize stripe that only insect transmission experiments can give a certain diagnosis.

For control it is recommended that the interval between crops should be extended to the maximum, volunteer plants should be destroyed, and that sowings in any given district should be made as nearly as possible at the same time.

Ryakhovsky (N. A.) & Gamarnik (F. D.). Испытание новых протравителей против головни Проса. [Tests of new dry seed disinfectants for the control of Millet smut.]—*Pl. Prot. Leningr.*, *1935*, 6, pp. 137–140, 1935. [Received July, 1936.]

The results of two consecutive years' experiments at the Ramonskaya Seed-breeding Station showed that millet [*Panicum miliaceum*] smut (*Ustilago panici-miliacei*) [*R.A.M.*, xv, p. 569] was very satisfactorily controlled by the seed-disinfectant dust nivarsene, at the rate of 1·25 gm. to 1 kg. seed, prepared by the Soviet administrative unit NIUIF. The dust was only slightly less effective than formalin 1 in 300.

Wang (C. S.). **Sclerospora graminicola on Millet in Minnesota.**—*Phytopathology*, xxvi, 5, pp. 462–464, 2 figs., 1936.

Millet (*Setaria italica*) and foxtail grass (*S. viridis*) were severely parasitized in two localities of Minnesota in the summer of 1935 by *Sclerospora graminicola* [*R.A.M.*, xiv, p. 577], causing a yellowish-green, longitudinal streaking of the leaves of the dwarfed plants (primary symptoms) and the chlorotic local lesions typical of secondary infection [ibid., viii, p. 99]. When the old conidiophores of the fungus were removed from the leaf blades with a cotton pad a fresh crop grew through the stomata within four to six hours and conidia were formed two to four hours later, the entire process taking eight to twelve hours (only six to nine in a moist chamber). During four days' field observations conidia were produced in the daytime as well as by night [ibid., vii, p. 712] at a temperature range of 17° to 34° C. and relative humidity of 75 to 100 per cent. The conidiophores on *S. italica* measured 182 to 251 μ in length (average 228 μ) and the conidia 21·4 by 14·2 μ (43 by 26·4 in the case of 50 giant specimens). On *S. viridis* the conidiophores averaged 184·4 μ in length, ordinary conidia 19·2 by 14·7 μ, and giant ones 40 by 21·7 μ. The zoospores (usually four to each conidium) were typically biciliate.

Harvey (E. M.) & Rygg (G. L.). **Physiological changes in the rind of California Oranges during growth and storage.**—*J. agric. Res.*, lii, 10, pp. 723–746, 5 graphs, 1936.

The results of storage experiments made in the course of this study with Washington Navel oranges from two localities of California indicate that late-picked fruit is most susceptible to brown stain (a rind blemish somewhat resembling common apple scald), and that the incidence of the trouble is increased by storage at 32° as compared with 42° and 52° F. With regard to pitting and spotting [see next abstract], the data are less clear-cut but seem to denote that susceptibility to these disorders depends on the environmental factors prevailing during the last few days before the picking of the fruit.

Harvey (E. M.) & Rygg (G. L.). **Field and storage studies on changes in the composition of the rind of the Marsh Grapefruit.**—*J. agric. Res.*, lii, 10, pp. 747–787, 2 pl., 1 diag., 13 graphs, 1936.

The results of storage experiments with Californian Marsh grapefruit showed that fruit from all the three localities covered by the

tests pitted and spotted [see preceding abstract] most severely at 42° and least at 52° F., the damage at 32° being intermediate in extent. Mature fruit picked at Corona and Fontana early in the harvest sustained greater injury at 42° than that gathered later, while at 32° the relations were reversed and at 52° there was never more than a trace of storage blemishes. The Oasis fruit varied strikingly with the season in its reaction to pitting and spotting at 32° and 42°, the defects increasing as time advanced at the former temperature, while at the latter they reached a climax early in the season, dropped to a minimum at mid-season, and increased again towards the close. Neither trouble occurred at 52°. Fruit held for one period at 52° and then transferred to lower temperatures only spotted slightly, whereas that held at 42° or 32° continued to spot on transference to 52°. Weakly acidified atmospheres accelerated and enhanced pitting and spotting, which were retarded, on the other hand, by weak alcohol and ammonia.

When solutions of naringin and its phenolic derivative, naringenin, were injected into the albedo of grapefruit rinds, naringenin was approximately 1,000 times more toxic to the rind tissues than naringin. Rinds injected with 0·1 to 0·6 mg. of naringenin and held for five days at 42° frequently developed spots resembling those observed in storage. The fruit of individual trees seemed to show collectively a fairly consistent relative susceptibility or resistance to injury from given quantities of naringenin, and in some instances this susceptibility to naringenin injury was apparently correlated with the amount of storage spotting of the fruit.

BAUMGART (S.). **Xyloporosis, the new disease, its causes and prevention.**—*Hadar*, ix, pp. 71–74, 1936. [Abs. in *Hort. Abstr.*, vi, 2, p. 133, 1936.]

The writer explains his reasons for attributing xyloporosis of budded lime stocks in Palestine [*R.A.M.*, xv, p. 162] to the stoppage of descending sap at the point of insertion of the bud. The disorder commonly affects unskilfully grafted or otherwise injured trees, and may be largely prevented by using the T instead of the inverted T incision when budding, thereby preventing wounds below the budding eye which might impede the flow of assimilated nutrients. Other possible factors requiring investigation are the penetration of toxic substances into the tissue at budding, the pressure exerted by the edges of the cut bark on the swelling bud between them, and trunk wounds during stub removal.

THOMPSON (A.). **Ustulina zonata on the Oil Palm.**—*Malay agric. J.*, xxiv, 5, pp. 222–226, 1 fig., 1936.

In addition to outbreaks of charcoal base rot of oil palms (infected tissue of which yielded a mycelium resembling *Ustulina zonata* in culture) [*R.A.M.*, xiv, pp. 81, 357] in two localities in Malaya in 1933, another case was found in 1936 on a 7-year-old palm which showed a decay of ten leaf bases, the tissue of which was dry, tindery, dull tawny-olive, and permeated at the bottom with black lines surrounding light or dark islands; perithecia of *U. zonata* were present on four of

the leaf bases. Pure cultures isolated from the stem tissues have been made with a view to inoculation experiments. It is recommended that all diseased leaf bases and tissue should be burnt.

FAHMY (T.). **Immunity in plants and immunity to Fusarium wilt in Cotton.**—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 143–151, 1936. [French summary.]

In the first part of this paper the author distinguishes and discusses with numerous examples three factors influencing the reaction of plants to disease, viz., the genetic composition of the host, the strain of the parasite, and the conditions favouring infection. In the second part he concisely summarizes his work since 1923 on the genetics of resistance to cotton wilt (*Fusarium vasinfectum* var. *aegyptiacum*) [*R.A.M.*, xiii, pp. 631, 632].

FRAPS (G. S.) & FUDGE (J. F.). **Relation of the occurrence of Cotton root rot to the chemical composition of soils.**—*Bull. Tex. agric. exp. Sta.* 522, 21 pp., 2 figs., 1935. [Abs. in *Exp. Sta. Rec.*, lxxv, 1, p. 65, 1936.]

In a study of the soil relations of *Phymatotrichum omnivorum* in Texas [*R.A.M.*, xv, p. 577], soils on which no damage was caused by cotton root rot contained on an average only about two-thirds as much total phosphoric acid, one-half as much nitrogen, total potash, and magnesia, one-third as much acid-soluble potash, one-fifth as much active phosphoric acid and active potash, one-seventh as much lime and basicity, and seven times as high a concentration of hydrogen-ions in the soil suspension as those where severe injury was sustained. The average composition of soils on which the effects of root rot were moderate or slight was generally intermediate between these two extremes.

LIKHITE (V. N.). **Stenosis in Gujarat Cotton.**—*Proc. Ass. econ. Biol., Coimbatore*, iii, pp. 15–17, 1 pl., 1936.

Cotton stenosis [*R.A.M.*, xv, p. 366] is stated to have been observed at Baroda experiment station since 1931; the condition usually affects the cut ratoon crop, though it may occur on a smaller scale in fresh and old crops and diseased plants are liable to die early. Various attempts to transmit the disorder by grafting were unsuccessful and it is doubtful whether it can be due to a virus. *Crotalaria juncea*, egg-plant, and sesame were also affected by a similar malformation.

LIKHITE (V. N.). **Host range of the Gujarat Cotton root rot.**—*Proc. Ass. econ. Biol., Coimbatore*, iii, pp. 18–20, 1 graph, 1936.

A field test carried out in Baroda showed the following hosts to be susceptible to *Macrophomina phaseoli*, the causal organism of the local form of cotton root rot [*R.A.M.*, xiv, p. 359; xv, p. 577]: sorghum, the smaller varieties of castor (*Ricinus communis*), *Hibiscus cannabinus*, *H. esculentus* [ibid., xiv, p. 83], *H. sabdariffa*, groundnut [ibid., xiv, p. 82], tobacco, sesame, soy-bean, papaw [ibid., xiv, p. 428], tomato, eggplant, and *Dolichos biflorus*, the fungus being isolated from the diseased

plants. The fungus was also present on a number of apparently healthy plants and on certain weeds.

LAYCOCK (T.). **Cotton seed disinfection experiments to control bacterial diseases of the Cotton plant.**—*Eleventh Bull. agric. Dep. Nigeria*, pp. 22–30, 1936.

In a seed disinfection test carried out in Nigeria in 1929 against bacterial wilt of cotton (*Bacterium malvacearum*) [cf. *R.A.M.*, vii, p. 31] treatment with 1 per cent. germisan in a 0·2 per cent. soap solution gave, 24 days after planting, no diseased stands, as against an average of 21 per cent. in the untreated controls; on 22nd November (after heavy rain) the figures were 37 and 69 per cent., respectively. In 1931–2 treated plots finally averaged 7·4 per cent. infection, as against 76·3 per cent. in the controls.

GAUTHIER (M[ARCELLE]). **Sur un nouvel entophyte du groupe des Harpellacées Lég. et Dub., parasite des larves d'Éphémérides.** [On a new entophyte of the group of Harpellaceae Lég. & Dub., parasitic on the larvae of Ephemeridae.]—*C.R. Acad. Sci., Paris*, ccii, 12, pp. 1096–1098, 4 figs., 1936.

The larvae of *Centroptilum luteolum* Müll. in the streams and ponds of the Dauphiné, France, have been consistently found to be parasitized by a fungus of the Harpellaceae closely allied to *Genistella* [*R.A.M.*, xiv, p. 630] from which it differs sufficiently, however, in spore form to justify the establishment of a new genus and species, *Glotzia centroptili* [with a diagnosis in French].

In common with the majority of Harpellaceae the fungus is furnished with a main axis 1 to 2 mm. in height (firmly attached to the rectal cuticle of the insect by a callus-like lateral projection of the basal cell), and two or three large secondary branches arising from its base; the latter likewise produce lateral ramifications generally ending (as also the main axis) in conidiophores 100 to 120 μ long and consisting of 6 or 7 cells bearing spores laterally in a spiral arrangement. These spores are cylindrical rods, 40 by 4 μ, and after detachment are provided at the basal end with two short appendages, between which uncoils an extremely slender, spiral filament at least 7 or 8 times the length of the spore. In addition to these azygospores, biconical zygospores, 50 to 60 by 15 μ, are formed by the fusion of two hyphae and become detached at maturity, taking with them the short pedicel on which they are obliquely inserted.

BALDACCI (E.). **La dénomination 'Actinomyces bovis' Harz. doit être supprimée comme 'nomen dubium'.** [The name '*Actinomyces* bovis' Harz. should be suppressed as a 'nomen dubium'.]—*Boll. Sez. ital. Soc. int. Microbiol.*, viii, 5, pp. 99–101, 1936.

Evidence is adduced that the name *Actinomyces bovis* [*R.A.M.*, xi, p. 242] has been applied to a number of different strains and must be rejected as a *nomen dubium*. The author recognizes *A. sulphureus* [ibid., x, p. 381] as a valid species and cites *Bacterium actinocladothrix*, *A.* sp. Protopopoff & Hammer (1890), *Oospora bovis*, and *A. bovis sulphureus* as synonyms.

Baldacci (E.). **Histoire, synonymie, et caractères culturaux de 'l 'Actinomyces sulphureus' Gasperini.** [The history, synonymy, and cultural characters of *Actinomyces sulphureus* Gasperini.]—*Boll. Sez. ital. Soc. int. Microbiol.*, viii, 5, pp. 102–105, 1936.

In this paper the author lists 11 synonyms of *Actinomyces sulphureus* [see preceding abstract] including, besides those previously mentioned, *A. bovis* Harz *fide* Waksman and also Lignières, and *A. hominis* [*R.A.M.*, v, p. 230]. In culture on glycerine nutrient agar (Waksman's formula) the fungus grows slowly, forming isolated, later confluent, circular or bubble-like, wax-coloured, blackish-brown, or brownish-yellow colonies, with a pulverulent, white, finally sulphur-yellow, very characteristic aerial growth, which makes its appearance on about the tenth day; there is slight blackening of the agar after about 50 days.

Dowding (Eleanor S.) & Orr (H.). **Transformation of Trichophyton gypseum into mosaic fungus.**—*Arch. Derm. Syph., Chicago*, xxxiii, 5, pp. 865–873, 14 figs., 1936.

Material from four patients having lesions containing the so-called 'mosaic fungus' [*R.A.M.*, xv, p. 582] without any organism developed no fungal growth on Sabouraud's medium. On the other hand, *Trichophyton gypseum* readily grew from scales containing both mosaic and normal hyphae. Observations of *T. gypseum* in potassium hydroxide preparations from the skin revealed a branched, septate mycelium, about 6 μ in width, comparatively straight at first, later becoming sinuous and reticulate and producing oidial spores by hyphal segmentation. When the walls of the dead fungal cells dissolve, a row of oil globules (simulating endospores) is left in the tissue; some of these bodies are converted into angular refracting segments constituting the mosaic fungus. Actual end-to-end contact has been observed between hyphae of *T. gypseum* and the 'mosaic fungus', the latter constituting a natural extension from the former. Moreover, during the healing process in a patient suffering from ringworm of the head, face, and hand, the living fungus decreased and the mosaic complex became more prominent.

Milian (G.). **Trichophytie de la main et éruptions secondaires à distance. Pathogénie.** [Trichophytosis of the hand and remote secondary eruptions. Pathogenesis.]—*Bull. Soc. franç. Derm. Syph.*, *1936*, 5, pp. 979–984, 1936.

Full clinical details are given of a case of trichophytosis of the right hand in a 55-year-old female patient, associated with remote secondary, atypical disturbances on the left forearm and both feet, the nature of which is discussed in relation to the theory of the transmission of infection either by toxins of the fungus (*Trichophyton asteroides*) [*T. mentagrophytes*: *R.A.M.*, xv, p. 92] or in response to allergic reactions. These hypotheses are not accepted by the writer, who believes the pathogen to have been circulated by the blood stream [cf. ibid., viii, p. 506 *et passim*]; this mode of infection would account for the difference in the appearance of the secondary lesions and those due to direct epidermal invasion.

Catanei (A.). **Les caractères de la résistance acquise dans les mycoses.** [The features of acquired resistance in the mycoses.]—*Bull. Soc. Path. exot.*, xxix, 5, pp. 451–457, 1936.

Following up his studies on the nature of acquired resistance to ringworm (*Ctenomyces* [*Trichophyton*] *mentagrophytes*) [see preceding abstract] in man and animals, the writer concisely summarizes the known facts concerning this phenomenon in relation to a number of other mycoses.

Hruszek (H.). **Untersuchungen über die pleomorphe Entartung von Dermatomyzeten. II. Mitteilung: 'Biologische' Pilznährböden.** [Studies on the pleomorphic degeneration of Dermatomycetes. Note II: 'Biological' nutrient media for fungi.]—*Derm. Wschr.*, cii, 19, pp. 622–623, 1936.

Pleomorphic degeneration in cultures of *Achorion gypseum* [*R.A.M.*, xiv, p. 580] on expressed onion juice was prevented by the previous growth on the same medium of wine-, press-, or baker's yeasts and *Monilia* [*Candida*] *pinoysimilis* [ibid., xiii, p. 162].

Dósa (A.). **Über Paronychia und Onychia blastomycetica (Panaritium blastomyceticum).** [On paronychia and onychia blastomycetica (panaritium blastomyceticum).]—*Derm. Wschr.*, cii, 18, pp. 582–584, 1936.

Associated with the twelve cases of paronychia and onychia recently examined at the Franz Josef University Clinic, Szeged, Hungary, were species of *Saccharomyces*, *Oidium*, and *Cryptococcus* [cf. *R.A.M.*, xv, p. 21]. Previous observations on these conditions are briefly summarized and the difficult problem of their cure discussed.

Mitchell (L. A.). **Torulosis.**—*J. Amer. med. Ass.*, cvi, 6, pp. 450–452, 1 fig., 1936.

Full clinical details are given of a fatal case of torulosis in a 53-year-old male Chinese. Members of the genus *Torula* are stated to be separable from the higher yeasts in their failure to form endospores or mycelia and from the Saccharomycetes in their pathogenicity and habitual non-fermentation of sugars [*R.A.M.*, xv, pp. 367, 502]. Representatives of this group grow readily on all laboratory media, the maximum development being made on Sabouraud's at room temperature. The cultures survive desiccation for a period of several months. The pathogenicity of these organisms to laboratory animals varies considerably, rabbits being practically immune, guinea-pigs, rats, and mice very susceptible. Cases of spontaneous infection in animals are on record. The most characteristic changes induced by torulosis are encountered in the central nervous system. The spinal fluid contains many yeast cells to which there is little or no reaction on the part of the host.

Bolsunova (Mme O.). Новый метод искусственного заражения семян льна культурой **Polyspora lini.** [A new method of artificial infection of Flax seeds with *Polyspora lini.*]—*Pl. Prot. Leningr.*, *1935*, 6, pp. 107–108, 1935. [Received July, 1936.]

By the method of inoculation described in this paper flax seeds are

placed in a thin layer on the bottom of Petri dishes, covered with a large bell jar, and atomized with a spore suspension of *Polyspora lini* [*R.A.M.*, xv, p. 441], the jet being directed from under the rim of the jar upwards, so that the seeds are inoculated by the fine mist of the suspension settling slowly upon them. The seeds are then collected in large flasks and left to dry in them for from two to four hours, no slime being produced. The inoculated seed gave 99·3 per cent. infection of the mature plants in September, as against 0·6 per cent. in the controls.

KAZINA (Mme O.). Влияние степени зараженности семян Льна полиспорозом на пораженность посевов и урожай. [The influence of the degree of Flax seed infection with *Polyspora lini* on the amount of injury to the crop and on yield.]—*Pl. Prot. Leningr.*, *1935*, 6, pp. 110–115, 1935. [English summary. Received July, 1936.]

The investigation briefly described in this paper was made in 1934 in the Leningrad region, following observations indicating the comparatively slow but steady spread of *Polyspora lini* [see preceding abstract] in several flax-growing areas of the U.S.S.R. of recent years. Seed of the highly susceptible flax variety A-776 was inoculated with a spore suspension of the fungus, and sown either alone or mixed in varying proportions with uninoculated seed in the middle of May; although it germinated poorly it was for all practical purposes attacked by *P. lini* alone. The tabulated results of the test showed that up to 8·5 per cent. infected seed did not appreciably affect the quality and quantity of yield in fibre and seeds; 10 to 15 per cent. reduced the yield of fibre by 6 to 11 per cent. and of seed by 8 to 15 per cent.; 15 to 25 per cent. by 13 to 15 and 20 to 25 per cent., respectively, and 100 per cent. infected seed by 20 to 25 and about 30 per cent., respectively. The first symptoms of the disease appeared at the bud formation stage of the flax plants in the form of breaking of the stems at the base, which appeared to be the point of entry of a *Fusarium* sp. which rapidly killed the plants.

FLOR (H. H.). **Flax seed-treatment tests.**—*Phytopathology*, xxvi, 5, pp. 429–438, 1936.

A tabulated account is given of four years' trials in the control of seed-borne diseases of flax, e.g., seedling blight (*Colletotrichum lini*), browning (*Polyspora lini*) [see preceding abstracts], wilt (*Fusarium lini*), and damping-off (*Pythium* and *Rhizoctonia* spp.) at eleven stations in Minnesota, North and South Dakota, and Montana. During the period under review *F. lini* was the only trouble of any importance, and none of the treatments used in one year's tests appreciably modified its incidence in the susceptible Damont variety either on infested or non-infested soils [*R.A.M.*, xi, p. 182]. None of the treatments consistently stimulated either stand or yield, though under the relatively humid conditions of south-eastern Minnesota a certain amount of benefit may be expected to result from the use of copper carbonate or ceresan at the rate of 4 oz. per bush. The formalin spray (1 in 320, 1 gall. per bush.) caused severe injury in some of the experi-

ments. It is concluded that, in general, flax seed treatment is not warranted in the regions under observation.

WILLIAMS (P. H.). **Rose diseases.**—*Rep. exp. Res. Sta. Cheshunt, 1935*, pp. 37–42, 1936.

In further investigations at Cheshunt into rose rust [*R.A.M.*, xiv, p. 638] nine strains of *Phragmidium* when tested for their ability to infect seven rose varieties fell into four groups. One strain from *Rosa laxa* and one from *R. rugosa* were found capable of infecting the rose, but strains from *R. canina* could not be transferred to it. There was no difference in the sizes of the uredospores of the different groups, but in the strains from cultivated roses 6-celled teleutospores were most abundant, 7- or 8-celled spores being commonest in the strains from briars, 7-, 8-, and 9-celled spores in a strain from *Rosa laxa*, and 7-celled spores in the remaining strains; with a few exceptions the average length of each class of spore was very close in all the strains, though when measurements of the 7-celled spores were tested statistically it was found that the rose strain examined was significantly different from the briar strains, while the latter were not significantly different from one another. Attempts to germinate the teleutospores each month were successful only during May, and only in the case of spores previously stored outdoors. [An account of this work is also given by W. F. Bewley in *Rose Annu., 1936*, pp. 106–114, 1936.]

SHELLEY (A. D. G.). **Black spot.**—*Rose Annu., 1936*, pp. 118–120, 1936.

In connexion with a popular account of black spot of roses, the writer points out that only the imperfect (*Actinonema*) stage of the causal organism, *Diplocarpon rosae* [*R.A.M.*, xv, p. 582], is known to occur in England, a fact that considerably simplifies control. In addition to such cultural measures as the excision and burning of diseased material, light autumn and drastic spring pruning, and the removal in early winter of the surface layers of soil from infected beds, the writer recommends two dormant applications, at a 10- to 14-day interval, of a solution of $\frac{3}{4}$ oz. copper sulphate per gall. of water, followed in the spring, and at least three times later in the season, by spraying with 3 pints sulsol [ibid., xiv, p. 560], 2 pints bouisol, and $\frac{1}{4}$ lb. lethalate [ibid., xiii, p. 104] per 100 galls. Agral N [ibid., xii, p. 744] may be substituted for lethalate, in which case 1 lb. is sufficient for 40 galls. of spray.

[PAGE (C.).] **Canker.**—*Rose Annu., 1936*, p. 115, 2 pl., 1936.

The cankers caused by *Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*: *R.A.M.*, xv, pp. 22, 468] may affect any part of a rose stem, sometimes occurring at the junction of the stock, as in Maréchal Niel. On varieties of the rambler type (the most generally susceptible), such as Emily Gray, Albéric Barbier, and American Pillar, the stems gradually become encircled by large, wart-like excrescences and finally die. The spores of the fungus gain access to the tissues through small wounds [ibid., ix, p. 722] made by the rose spines, by friction between

the shoots, or by hailstones. All diseased material should be excised and burnt, and the cut surfaces coated with painters' knotting. Knives or other implements should be disinfected to prevent dissemination.

WHITE (H. L.). **A survey of Carnation 'stem rot' diseases, 1925–35.**—*Rep. exp. Res. Sta. Cheshunt, 1935*, pp. 43–46, 1936.

Notes are given on a number of carnation diseases observed during the period 1925 to 1935 in the vicinity of Cheshunt. During prolonged damp periods in winter a wilt due to a species of *Botrytis* is common, but could probably be eliminated by increased temperature. The diseases caused by species of *Fusarium* fall into two groups, (*a*) those due to semi-parasitic species and (*b*) those due to actively parasitic species, such as *F. dianthi* [*R.A.M.*, xv, p. 584]. Among the soil-inhabiting species belonging to the former group, *F. scirpi* var. *acuminatum* appears to be the commonest, having been isolated in a high percentage of cases from carnation roots attacked by *Verticillium cinerescens* [ibid., xv, p. 225]. In some instances the fungus appeared to be pathogenic. *F. culmorum* [loc. cit.] was present in up to 70 per cent. of carnation roots infected by *V. cinerescens*, and the evidence obtained indicated that it can behave as a very active pathogen. Two types of infection by *F. culmorum* may be due to a contaminated water supply, viz., a foot rot of unrooted cuttings, in which infection spreads rapidly at high temperatures through moist sand, and a slow wilt. In the latter type of disease infection occurs at the junction of the main limbs where water collects after spraying, and the lesions spread very slowly in relatively cool conditions. Lesions due to *F. culmorum* are common in the pith and cortex of carnation plants, and in the wood for distances of a few inches, but as a rule the fungus does not cause a true vascular wilt.

Mention is also made of *Rhizoctonia* collar rot, which, though rare, may cause serious losses, and is believed to be associated with moist, heavy soil; *Sclerotinia* collar rot, causing the whole plant to wilt, observed only once; and *V. cinerescens*, at present the most important carnation disease in England [see next abstract].

WHITE (H. L.). **Verticillium wilt of the Carnation.**—*Rep. exp. Res. Sta. Cheshunt, 1935*, pp. 46–50, 1936.

In further studies on carnation wilt (*Verticillium cinerescens*) [see preceding abstract] isolations from cuttings from diseased plants were successfully inoculated into healthy carnations and the fungus was re-isolated from 24 out of 30 plants.

Six young carnation plants of the Spectrum variety inoculated with *V. cinerescens* on 31st May, 1935, developed complete wilt in periods ranging from 45 to 106 days, the mean rate of growth of the fungus being nearly 0·6 cm. per day in June and July, as compared with 0·4 cm. during September and October in an earlier experiment.

Inoculations in triplicate with 21 cultures, mainly species of *Fusarium*, isolated from the cortex and roots of wilting carnations infected by *V. cinerescens* gave negative results with one exception, apparently a strain of *F. culmorum* [loc. cit.]; it is concluded that the fungi were

secondary, having invaded the tissues following primary infection by *V. cinerescens*. From further inoculations (by pricking at the basal joints of a single shoot) with eight strains of *V. cinerescens* on 32 carnation plants of the Topsy and Spectrum varieties definite evidence of differential varietal susceptibility was obtained, Topsy being the more susceptible to strains 3, 5, 6, and 8, Spectrum to strain 4. Contrary to previous reports [ibid., xii, p. 633], *V. cinerescens* was not found pathogenic to asters.

AINSWORTH (G. C.). **Detection of spotted wilt virus in Chrysanthemums.**—*Nature*, cxxxvii, 3473, p. 868, 1936.

It has been found that the use of 0·5 per cent. solution of anhydrous sodium sulphite in preparing an extract of chrysanthemum leaf containing the spotted wilt virus [*R.A.M.*, xv, p. 444] facilitates the detection of the latter in tests on inoculated tobacco leaves; in one experiment 16 lesions resulted from the sulphite-prepared extract of half-leaves compared with 0 from the water extract of the remaining halves. The symptoms of the disturbance in chrysanthemum are ordinarily of a somewhat indefinite nature, and the difficulty of detecting infection, even in plants known to be infected, may be due to the inactivation of the virus by the oxidizing enzymes or oxidation products present in the juice.

BLUMER (S.). **Die Ausbreitung des Löwenmaulrostes (Puccinia antirrhini Dietel et Holway).** [The distribution of the Snapdragon rust (*Puccinia antirrhini* Dietel & Holway).]—*Mitt. naturf. Ges. Bern, 1935*, pp. xxvi–xxvii, 1936.

In connexion with the detection in the summer of 1935 of *Puccinia antirrhini* on *Antirrhinum majus* [*R.A.M.*, xv, p. 442] in and around Berne, the writer briefly considers the spread of the fungus and some other rusts from their places of origin to different parts of the globe and the parallel expansion of their circle of hosts.

OYLER (E.) & BEWLEY (W. F.). **A disease of cultivated Heaths.**—*Rep. exp. Res. Sta. Cheshunt, 1935*, pp. 50–56, 1936.

In a further study of the wilt of *Erica hiemalis, E. nivalis*, and *E. willmoreana* previously reported as associated with a *Phytophthora* [*R.A.M.*, xiv, p. 637] the authors found that inoculations of healthy branches of *E. hiemalis* with pure cultures of the organism (identified by S. F. Ashby as *P. cinnamomi* [ibid., xv, p. 378]) caused wilting within six days. Infection was obtained by inoculating lateral branches, the main stem at soil-level, the soil of pots containing healthy plants, and by standing pots containing healthy plants on sterilized ashes infected with a pure culture of the fungus. Inoculations on *E. gracilis* gave negative results, confirming the experience of growers as to the resistance of this species. The fungus was, however, found capable of infecting *Antirrhinum*, beech seedlings, calceolaria, and *Schizanthus*, of causing gall formation at the point of inoculation in *Nicotiana glutinosa* stems, and of rotting apple and tomato fruits.

Cultural studies showed that the compost used for the raising of

heaths is a very favourable medium for the growth of *P. cinnamomi*; rain-water, greatly favoured by growers for watering purposes, was more conducive to the growth of the fungus than tap-water.

No evidence was obtained that the disease starts in the propagating houses. As plants became infected when placed on infected ashes it is apparent that sterilization of the 'standing-out' ground in which the plants are placed after removal from the glasshouse is essential after each crop. The water in the tanks was found to contain large quantities of the organism, and therefore constituted a serious source of contamination. Balls of compost and roots from unmarketed plants used for mulching and other purposes were ascertained to be a third source of contamination.

Control should be based on improved sanitary methods and the use of Cheshunt compound as a soil disinfectant [ibid., xiv, p. 637]. Copper sulphate, because of its low cost and safety, is recommended for disinfecting the standing-out ground. Peat from the neighbourhood of beech trees should not be used in making the compost.

Van Slogteren (E.). **De beteekenis van klimaat- en transport-invloeden voor de gebruikswaarde van tuinbouwproducten, in het bijzonder van bloembollen. Een phytopathologisch-physiologisch onderzoek.** [The influence of climatic and shipping conditions on the demand for horticultural products, especially flower bulbs. A phytopathological and physiological study.]—*Tijdschr. PlZiekt.*, xlii, 5, pp. 117–158, 48 figs., 1 diag., 5 graphs, 1936. [English summary.]

The writer discusses, on the basis of investigations at the Bulb Research Laboratory, Lisse, Holland, the influence of environmental conditions, such as humidity and temperature, during storage and shipping on the flowering capacity of bulbs. In this connexion reference is made to the similarity of the effect of overheating the bulbs to attack by yellow rot (*Pseudomonas hyacinthi*) [*R.A.M.*, xv, p. 298]. The external aspect of a bulb is not necessarily a reliable index of its flowering capacity, which may not be adversely affected by superficial injuries caused during transit by mites or secondary fungi (e.g. *Penicillium glaucum* and *Aspergillus niger*), while conversely, apparently sound material may be worthless owing to damage from overheating at this period. Special attention should be paid to the elimination of this factor and others tending to lower the marketable value of the bulbs.

Dame (F.). **Die Grauschimmelkrankheit der Tulpen, ihr Auftreten und ihre Bekämpfung.** [The grey mould disease of Tulips, its occurrence and control.]—*Blumen- u. PflBau ver. Gartenwelt*, xl, 18, p. 207, 4 figs., 1936.

Heavy damage is stated to be inflicted on tulips in Germany by grey mould [*Botrytis tulipae*: *R.A.M.*, xv, p. 508], the symptoms of which are briefly described]. Control may be effected by clean cultivation, supplemented by half-an-hour's immersion of the bulbs in 0·25 per cent. uspulun; at the commencement of forcing and two days later the bulbs may again be disinfected by pouring the same solution over them.

Gomez-Menor (J.). **Hongos que ocasionan daños a las plantas 'Flor de Sol'.** [Fungi that damage Sunflower plants.]—*Rev. Agric., S. Domingo*, xxvii, 80, 2415, 1936.

Popular notes are given on the occurrence and control in the Dominican Republic of *Rhysotheca* [*Plasmopara*] *halstedii* [*R.A.M.*, xii, p. 571], *Erysiphe cichoracearum* [ibid., xiii, p. 804], and *Phragmidium* sp. on sunflower leaves.

Barthelet (J.) & Gaudineau (Mlle M.). **Les maladies des Cyclamens.** [Cyclamen diseases.]—*Rev. Path. vég.*, xxiii, 2, pp. 101–122, 3 pl., 6 figs., 1936.

In the summer of 1935 several thousand cyclamens [*Cyclamen persicum*] growing near Paris showed abortion of the floral buds as a result of infection by *Gloeosporium cyclaminis* [*R.A.M.*, v, p. 741; xi, p. 650], not previously recorded in France. Affected plants commonly showed a withering of the leaf buds when 1 to 3 cm. long, but infection sometimes appeared at a later stage of development, lesions being formed on the petioles and on the peduncles near the flower, in which case the partially opened flowers withered and fell off at the least touch. Brown depressed spots, 2 to 3 cm. long, were occasionally noted on the peduncle of flowers already open, and rarely light brown, then blackish, triangular sectors were found on the petals. On the leaves circular depressed spots, 5 or 6 mm. in diameter, may also be due to the fungus. Infected material showed the presence of conidiophores, measuring 30 to 40 by 3 μ, and oblong-cylindrical conidia, 16 to 17 by 3·5 to 5 μ. The fungus grew freely in culture and on oat agar produced an abundant white mycelium which after a few days formed conidial stromata and darkened in colour owing to the development of a pseudo-stromatic layer; the conidia were rose colour in the mass. Inoculations with pure cultures through punctures on the branches and young buds rapidly reproduced the symptoms of the disease. A test with a commercial mixture of copper oxychloride indicated that applications with this mixture made early in summer would afford adequate protection to cyclamens grown either in the open or under glass.

In 1930 eight or ten different cyclamen varieties growing near Paris showed light punctiform spots on the floral buds which later reached 2 or 3 mm. in diameter, and sometimes became confluent; the flowers became dwarfed and deformed. Infected material showed the presence of a *Fusarium* resembling *F. avenaceum* with 5- to 7-septate spores with a not very evident basal cell, measuring 90 by 4 to 6 (average 80 by 4·75) μ.

Brief notes are given on the following cyclamen leaf diseases: *Phyllosticta cyclaminis* [loc. cit.], *Glomerella rufomaculans* [ibid., ix, p. 765], *Phoma cyclamenae* [ibid., vi, p. 164], and *Botrytis cinerea*.

Servazzi (O.). **La colletotricosi o maculatura fogliare della Calla.** [Colletotrichosis or leaf spot of Calla Lily.]—*Boll. Lab. sper. e Reg. Oss. Fitopat. Torino* [formerly *Difesa Piante*], xiii, 1–2, pp. 10–11, 1936.

The leaves of Calla lilies (*Zantedeschia*) *ethiopica* growing in glasshouses

near Turin bore round or elliptical, sharply defined, isolated or confluent, dark-olivaceous spots 2 to 10 mm. in diameter, with a light, ochraceous-yellow, round centre, showing the presence of *Colletotrichum montemartinii*, with pointed, light yellow setae 100 to 130 μ long and up to 6 μ in diameter at the base, and generally curved, cylindrical or ellipsoidal conidia, up to 25 by 5 μ. Numerous wild *Arum italicum* plants growing in the vicinity were also infected, and the author considers that the disease may have spread from these to the Calla lilies. On partly withered leaves of *A. italicum* a *Phyllosticta*, regarded as a secondary parasite, was also occasionally found in association with *C. montemartinii*.

Preliminary tests on *A. italicum* indicated that satisfactory control of the disease may be obtained by the destruction of badly infected leaves and spraying with 1 per cent. naphthol β [ibid., xiii, p. 790] with 0·35 per cent. of sodium carbonate. Wild *A. italicum* plants near the glasshouses should be destroyed.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **Fusarium crown and root rot, and Sclerophoma stem blight, of the Texas Bluebell.**—*Bull. Torrey bot. Cl.*, lxii, 9, pp. 503–510, 2 figs., 1936.

This is an expanded account of the writers' investigations on crown and root rot (*Fusarium solani*) and *Sclerophoma* stem blight (*S. eustomonis* n.sp.) of the Texas bluebell (*Eustoma russellianum*), a preliminary note on which has already appeared [*R.A.M.*, xiii, p. 448]. *S. eustomonis* [English and Latin diagnoses of which are given] is characterized by dark-coloured, flattened, lenticular pycnidia embedded in a stromatic layer in the cortical tissue of the host, 135 to 300 μ in diameter by 85 to 145 in depth, and by cylindrical, continuous, hyaline conidia, 4·5 to 8·7 by 2·1 to 3·1 μ (mean 6·8 by 2·5 μ), borne on short conidiophores with almost invisible tips. The fungus was shown to be disseminated by the mealy bugs (*Pseudococcus maritimus*) which commonly attack *E. russellianum*. A strain of the flower with narrow leaves has manifested a high degree of resistance to *S. eustomonis*.

PANNIER (R.). **Flagellose d'une Euphorbe des environs de Banyuls-sur-mer.** [Flagellosis of a *Euphorbia* in the vicinity of Banyuls-sur-mer.]—*C.R. Soc. Biol., Paris*, cxxii, 19, pp. 374–377, 9 figs., 1936.

Euphorbia exigua plants were found to be parasitized to the extent of 20 per cent. by flagellates ranging in diameter from 5 to 24 μ, the larger individuals (of which torsion was a conspicuous feature) resembling *Herpetomonas tortum* and the smaller ones approximating in dimensions and nuclear characters to *H.* [*Leptomonas*] *davidi* [*R.A.M.*, xiii, p. 254]. In the writer's opinion only one species (the latter) is involved, the large contorted individuals being merely older and not essentially distinct from the small ones.

DEMOLON (A.) & DUNEZ (A.). **La fatigue des sols. Cause et remèdes.** [Soil exhaustion. Cause and remedies.]—*C.R. Acad. Sci., Paris*, ccii, 20, pp. 1704–1706, 1936.

Further data are presented to exemplify the close connexion between the presence in lucerne plants of the bacteriophage of *Bacillus radicicola*

and the failure of the crop [*R.A.M.*, xiv, p. 743 and next abstract]. The elimination of the bacteriophage from lucerne fields and the reintroduction into the soil of lysis-resistant, polyvalent cultures of *B. radicicola* are briefly discussed.

VANDECAVEYE (S. C.) & KATZNELSON (H.). **Bacteriophage as related to the root nodule bacteria of Alfalfa.**—*J. Bact.*, xxxi, 5, pp. 465–477, 2 figs., 1936.

A potent lytic principle active against *Rhizobium meliloti* [*Bacillus radicicola*] was isolated from ten soils from the Yakima district of Washington and round Ellensburg carrying lucerne stands three or more years old [see preceding abstract] and from the root tissue of three-year-old plants in one field. Indications of the presence of a lytic principle were detected in the poor development of the nodules. The possible role of bacteriophage in the reduction of lucerne yields is briefly considered, but definite conclusions on this point are reserved pending further studies.

YARWOOD (C. E.). **The diurnal cycle of the powdery mildew Erysiphe polygoni.**—*J. agric. Res.*, lii, 9, pp. 645–657, 1 diag., 1936.

The salient features of this amplified account of the writer's studies on the diurnal cycle of clover powdery mildew (*Erysiphe polygoni*) [see next abstract] have already been noticed from another source [*R.A.M.*, xiv, p. 174]. In preliminary investigations of *E. polygoni* on cabbage [ibid., viii, p. 4] similar relationships were established, but no definite variations in responses to day and night were expressed by conidial germination in *E. graminis* on barley [ibid., xv, pp. 568, 585].

YARWOOD (C. E.). **Host range and physiologic specialization of Red Clover powdery mildew, Erysiphe polygoni.**—*J. agric. Res.*, lii, 9, pp. 659–665, 1 fig., 1936.

Fourteen *Trifolium* species out of 20 tested in the field, in the greenhouse, and in dish cultures showed varying degrees of susceptibility to powdery mildew (*Erysiphe polygoni*) [see preceding abstract] from red clover (*T. pratense*), including *T. lupinaster*, *T. striatum*, *T. angustifolium*, *T. hybridum*, and *T. squarrosum*; *T. repens* reacted positively in the field and very slightly in dish cultures, but not in the greenhouse.

Three physiologic forms of the fungus were distinguished on the basis of differences in the reaction to inoculation of certain red clover clones [*R.A.M.*, iv, p. 431]. One of these forms appears to be very widespread in the United States and Canada, while the two others are of rare occurrence.

These investigations were greatly facilitated by the culture of *E. polygoni* on living excised clover leaflets floating on a 10 per cent. sucrose solution [ibid., xiii, p. 773].

KUSANO (S.). **On the parasitism of Olpidium.**—*Jap. J. Bot.*, viii, 2, pp. 155–187, 8 figs., 1936.

The results of inoculation experiments with *Olpidium viciae* from *Vicia unijuga* on *V. faba* and peas [*R.A.M.*, xi, p. 720] indicated that the juice from vigorous portions of the hosts contains sufficient

potassium to exert a positive chemotactic stimulus on the pathogen equivalent in strength to that of a 1/10 mol. solution of potassium chloride. No other substances residing in the host cells attract the fungus in the same way as potassium, which may also occur in non-host plants of *O. viciae*, such as tomato and *Dahlia variabilis*, in combination, however, with toxic or repellent principles counteracting the chemotactic stimulus normally exerted by potassium. This element not only attracts the swarm cells of the fungus to the surface of the host cell but also assists the penetration of the infection-tube through the wall. The profuse excretion of potassium to the surfaces of the young parts of the host is thought to explain the susceptibility of the latter to infection by *O. viciae*, and conversely the failure of the fungus to enter the older portions is attributed to the sparse output of potassium at this stage rather than to any mechanical impediment.

Whenever the swarm cells encyst upon the cell surface they exercise an invading action on the cell, against which the plant reacts by the formation of more or less extensive deposits of callus round the infection-tube. In susceptible hosts (e.g., *V. unijuga*, *V. faba*, and peas) most of the tubes penetrate the callus, in the less congenial hosts (e.g., *Impatiens balsamina*, *Taraxacum platycarpum*, and *Oenothera* spp.) the callus is more effective in defence, while in some non-host plants (e.g., *Chrysanthemum sinense* and lettuce) it prevents infection altogether. Four types of callus formation are distinguished, viz., button or peg, filamentous, sac-like, and thick conical or cylindrical, the latter two preventing the infection-tube from entering the cell cavity. Resistance, therefore, is considered to depend on two factors: (1) the presence of a defensive substance according to the nature or amount of which the parasite may be prevented from approaching the cell, probably from entering it after reaching its surface, or from developing after entering it; and (2) callus formation. It is suggested that haustorial parasites may show an analogous relation to the host plant, the host cell selected for haustorial invasion containing in some cases both attractive and defensive substances, the former diffusing outside the cell and the latter remaining within and acting injuriously on the developing haustorium.

EASTHAM (J. W.). **The relation between climate and the incidence of some orchard diseases in British Columbia.**—*Proc. fifth Pacif. Sci. Congr., 1933*, iv, pp. 3229–3232, 1935.

The three regions devoted to commercial fruit-growing in British Columbia may be differentiated into (1) the moist coastal belt; (2) the arid interior plateau and valleys, including the Okanagan Valley and the southern tip of Vancouver Island where the low annual rainfall necessitates artificial irrigation; and (3) an inland district of moderate precipitation and fairly low winter temperatures comprising the Arrow Lake and Kootenay country.

The most characteristic disease in area (1) is apple anthracnose (*Neofabraea malicorticis*) [*R.A.M.*, xv, p. 481]. In (2) physiological diseases are responsible for heavy damage, while fireblight (*Bacillus amylovorus*), first definitely recorded in 1912, assumed a virulent form until it was effectively combated by improved control methods and rigid official inspections. The chief epidemic disease in area (3) is apple

scab (*Venturia inaequalis*), which may be serious in the northern part of the valley, where precipitation reaches 15 in. or more per annum, but is practically unknown south of Kelowna, where the excessively dry summer atmosphere apparently prevents the development of the fungus on the leaves, so that there is no primary inoculum in the spring. In the Fraser Valley *S. americana* [*S. fructicola*: ibid., xv, pp. 531, 592] is destructive on stone fruits in wet seasons. Blossom blight of sweet cherries (*Monilia oregonensis*) is virulent in the south of Vancouver Island [ibid., xiv, p. 495], but perennial canker of apples (*Gloeosporium perennans*) [ibid., xiii, p. 523] does not seem to be spreading with great rapidity.

HOLZ (W.). **Zur Färbung des Myzels von Fusicladium dendriticum in Apfelblättern.** [On the staining of the mycelium of *Fusicladium dendriticum* in Apple leaves.]—*Zbl. Bakt.*, Abt. 2, xciv, 9–13, p. 195, 1936.

Further experiments on the technique of staining to detect the presence of the mycelium of *Fusicladium dendriticum* [*Venturia inaequalis*] in apple leaves [*R.A.M.*, xv, p. 28 and next abstract] have shown that a cotton blue solution (50 gm. each of phenol, lactic acid, and glycerine and 1 gm. of cotton blue to 100 gm. of distilled water, used at the rate of 1 part of the solution to 9 of water) is sufficient for this purpose without preliminary treatment with gentian violet. The stained leaves should be washed in water until the veins are sky-blue; the other steps in the method are as previously recommended.

WINKELMANN (A.) & HOLZ (W.). **Beiträge zur Biologie und Bekämpfung des Apfelschorfes (Fusicladium dendriticum [Wallr.] Fckl.). II.** [Contributions to the biology and control of Apple scab (*Fusicladium dendriticum* [Wallr.] Fckl.) II.]—*Zbl. Bakt.*, Abt. 2, xciv, 9–13, pp. 196–215, 4 figs., 4 graphs, 1936.

Continuing their studies in the Berlin district on the life-history and control of apple scab (*Fusicladium dendriticum*) [*Venturia inaequalis*: *R.A.M.*, xiv, p. 589], the writers found that from 1st November until the beginning of January the increase in perithecial diameter was very slight, being hindered rather than promoted by high temperatures, which are essential, on the other hand, to the process of maturation. The liberation of the ascospores takes place most actively during rain following a brief warm spell in the spring, frequency rather than quantity of precipitation being the decisive factor in the extent of the discharge. In 1935 the first ascospores on fallen leaves in the open were detected on 2nd April and dispersion was virtually concluded by 26th May; the first ascospores were trapped in the air on 10th April and the last on 18th May. Leaves exposed to temperatures of 12° and 18° C. on 18th February (when perithecial development was complete) discharged ascospores after 13 days.

The optimum temperature for infection by *V. inaequalis* was experimentally shown to be about 19° [ibid., xv, p. 480], the incubation period being 9 to 14 days in the case of ascospores and 8 to 10 in that of conidia. Seedling trees kept in the dark prior to inoculation showed heavier infection than those exposed to the light, evidently as a result

of metabolic disturbances. At temperatures below 10° conidial and mycelial infections were accompanied by the formation of appressoria, which only developed under warmer conditions when hyphal penetration was impeded by external agencies. In a few of the seedlings belated infections, manifested by the appearance of pale spots on the leaves 10 to 14 days after inoculation, caused serious damage.

Good control of scab was obtained by three applications of 1 per cent. Bordeaux mixture on 14th, 20th, and 26th April, the earliest date anticipating the first copious dispersal of ascospores, the second preceding and the third coinciding with the most prolific distribution of these organs.

CROWELL (I. H.). **Index to the relative susceptibility of orchard Apples to Cedar-Apple rust.**—*Phytopathology*, xxvi, 5, pp. 459–461, 1936.

The following method is employed by the writer for the determination of the reactions of orchard apples to cedar-apple rust (*Gymnosporangium juniperi-virginianae*) [*R.A.M.*, xiv, p. 771; xv, pp. 484, 487]. Varieties with leaves bearing no evident infection spots are classed as immune and those with 1 to 5, 6 to 15, and 16 or more aecidia per lesion (this number having been found to be directly related to the number of lesions per leaf) as slightly, moderately, and very susceptible, respectively. Intermediate between the immune and slightly susceptible groups is the 'spermogonial host' category, comprising those varieties on which infection results solely in spermogonial development. For all practical purposes such hosts may be regarded as highly resistant, since the rust cannot be perpetuated in the absence of aecidia.

HILDEBRAND (E. M.) & PHILLIPS (E. F.). **The honeybee and the beehive in relation to fire blight.**—*J. agric. Res.*, lii, 10, pp. 789–810, 1 fig., 1 graph, 1936.

This is an amplified account of the work on honeybees [*Apis mellifica*] in relation to apple and pear fireblight (*Erwinia amylovora*) [*Bacillus amylovorus*: *R.A.M.*, xv, p. 589] which has already been briefly described by the first-named writer [ibid., xiv, p. 370]. Using a synthetic culture solution as a base, the maximum sugar concentrations permitting the growth of the organism in dextrose, levulose, artificial nectar, and sucrose were 30, 30, 35, and 58 per cent., respectively. Bees were found to be instrumental in spreading the disease in two ways, (1) by conveying the bacteria from the hive to the fruit blossoms, and (2) by disseminating the inoculum from flower to flower. Transmission in the first instance, however, is conditional on the active feeding of the insects on contaminated food.

ROSEN (H. R.). **The influence of dry air on the longevity of the fire-blight pathogen.**—*Phytopathology*, xxvi, 5, pp. 439–449, 1 fig., 1936.

In air-dry exudate of *Bacillus amylovorus* [see preceding abstract] attached to blighted pear twigs and exposed to laboratory air at Fayetteville, Arkansas, for varying periods, the organisms were found to be dead at the end of a year. On the other hand, they were still

viable and infectious about a year after being placed over concentrated sulphuric acid in an atmosphere approaching a relative humidity of zero. Fireblight exudate kept in corked vials suspended from an apple limb in an orchard yielded no viable bacteria after a period of less than three months, while viability was apparently lost within three weeks of extrusion by infective material left *in situ* on a cankered pear trunk exposed to direct sunlight during the intensely dry summer of 1934. No viable bacteria were detected in 67 soil samples from beneath severely blighted apple and pear trees during the winter of 1934–5, but owing to the imperfect technique at present available, these results are regarded as inconclusive. Viable bacteria kept under extremely dry conditions for about a year stained violet or violet-red by the Proca-Kayser method (*J. Bact.*, xxvii, p. 175, 1934), whereas the dead ones were coloured clear red.

RIKER (A. J.), PALMITER (D. H.), & HILDEBRAND (E. M.). **Some environmental factors influencing the development of hairy root on Apple.**—*J. agric. Res.*, lii, 9, pp. 715–721, 1 fig., 3 graphs, 1936.

The outstanding results of the authors' studies on the relation of certain environmental factors to the development of hairy root (*Phytomonas* [*Bacterium*] *rhizogenes*) on apple, of which this is an expanded account, have already been noticed from another source [*R.A.M.*, xiv, p. 369].

DE LONG (W. A.). **Variations in the chief ash constituents of Apples affected with blotchy cork.**—*Plant Physiol.*, xi, 2, pp. 453–456, 1936.

Analysis of two sample lots of Fallawater apples from the same orchard, one of which was affected with blotchy cork (known locally as bitter pit) [*R.A.M.*, xiii, p. 170; xv, p. 446], showed that the affected and unaffected fruits contained, respectively, 0·052 and 0·071 gm. calcium per 1,000 gm. fresh weight. Two years later, five samples of 30 apples each of the Stark variety were gathered directly from the trees at Windsor Forks and Kentville, Nova Scotia, and classified as affected (*a*) very severely, (*b*) severely, (*c*) slightly to moderately, or (*d*) unaffected, though in some cases from susceptible trees, and (*e*) from trees never affected with any disorder of the cork type; the amount of calcium present in the parings and flesh of each sample was then determined and expressed as a percentage of the quantity found per unit of fresh weight in the healthy sample (*e*), the figures obtained for the five samples being, respectively, 40, 51, 62, 68, and 100 per cent. for the parings, and 59, 67, 67, 79, and 100 per cent. for the flesh. The cause of this apparent calcium deficiency in the affected fruit is uncertain, but data obtained indicated that it may result from competition for this element between leafy shoot and fruit tissues during the early stages of growth.

GÜLL (A.). **Über das Glasigwerden der Äpfel.** [On the glassiness of Apples.]—*Obst- u. Gemüseb.*, lxxxii, 5, p. 71, 1936.

A semi-popular note is given on glassiness of apples [*R.A.M.*, xiii, p. 316] which is attributed either to drought or superabundant

nutrition, the condition in the former case being associated with a not unpleasant juiciness and sweetness, whereas in the latter the flavour is disagreeably insipid. The White Astrachan variety appears to be particularly liable to glassiness, but Golden Pearmains, Charlamovski, and other varieties may also be similarly affected.

REEVES (E. L.). **Mottle leaf of Cherries.**—*Proc. Wash. St. hort. Ass. 1935*, xxxi, pp. 85–89, 1936. [Abs. in *Hort. Abstr.*, vi, 2, p. 111, 1936.]

The symptoms of mottle leaf of cherry [*R.A.M.*, xv, p. 480] are described, with observations on its detrimental effects on the fruit. Microscopic examination has revealed neither fungi nor bacteria in the diseased tissues, and injections of salts of zinc, copper, and iron gave negative results. Transmission of the disease to healthy trees has been effected, however, by budding and grafting (not root grafting) both from rootstock to scion and vice versa. Affected trees (which seem to be incapable of recovery) should be removed as soon as they cease to be commercially productive.

EASTWOOD (H. W.). **Destruction of Banana plants. Experiments prove that oils are too costly.**—*Agric. Gaz. N.S.W.*, xlvii, 4, pp. 193–199, 15 figs., 1936.

In a banana eradication test carried out in New South Wales 16 Cavendish banana stools were treated with applications of 1 to 6 pts. of oil [*R.A.M.*, xiv, p. 13; xv, p. 76]. Promising results were obtained only with five stools, treated with either 6 pts. power kerosene (sp. gr. 0·805 to 0·81, closed f.p. 105° F.), 2, 4, or 6 pts. light gas oil (0·81 to 0·83, f.p. 155° to 160°), or 4 pts. Diesel oil (0·865, f.p. 180° to 190°). Heavy Diesel oil was a failure. The lowest rate of successful application (2 pts. per stool) amounts to 100 galls. per acre, which at the lowest price of any of the oils used works out at £3 15*s.*, or including the lowest cost of labour, a minimum of £5 10*s.* per acre, as against £4 to £5 per acre for uprooting and cutting up the plants. The use of oils for the eradication of banana plants, therefore, is uneconomic and cannot be recommended save in exceptional cases where special circumstances make the cost of digging-out excessive.

UPPAL (B. N.). **India: a serious disease of Guava in Bombay.**—*Int. Bull. Pl. Prot.*, x, 5, p. 99, 1936.

Physalospora psidii [*R.A.M.*, xiii, p. 269] has been observed in Dholka and North Gujarat, Bombay Presidency, causing a severe disease of guava. Infection originates in the bark and spreads rapidly along the stem from one branch to another, resulting in desiccation, cracking, decortication, death of the affected parts, and finally of the whole tree. Numerous perithecia of the causal organism were found scattered over the dead bark.

ADAMS (J. F.) & PRIODE (C. N.). **Fungicide No. 66.**—*Trans. Peninsula hort. Soc.*, xxv, 5, pp. 40–45, [1936].

In an investigation of a large number of detergents and their derivatives as fungicides, preparation no. 66 (an organic sodium

sulphonate) showed marked potential fungicidal efficacy. For field use its adherent properties have to be increased by the addition of bentonite [see below, p. 666] and hydrated lime, each 0·1 per cent. Applications of this spray at 0·3 per cent. concentration to beans growing in the greenhouse made when the first leaves were expanded and again twice at fortnightly intervals efficiently controlled powdery mildew [*Erysiphe polygoni*]. The control of apple scab [*Venturia inaequalis*] given by this fungicide in a season extremely conducive to infection compared favourably with that given by lime-sulphur on all varieties used except Paragon, while the control of sooty blotch [*Gloeodes pomigena*] and fly speck [*Leptothyrium pomi*] was as good as that given by either lime-sulphur or Bordeaux mixture. No foliage injury was caused by the fungicide, and the finish of the fruit was commercially excellent.

The new fungicide has no conspicuous residue, is compatible with insecticides, possesses some insecticidal properties, and is a heavy wetting agent; as a sulphur wetting agent it must be carefully used to prevent extreme flocculation.

Adams (J. F.). **Sulphur fungicides.**—*Trans. Peninsula hort. Soc.*, xxv, 5, pp. 48–54, 1 graph, [1936].

Laboratory tests with apple scab [*Venturia inaequalis*] spores demonstrated that the toxicity of lime-sulphur (2 in 100) was lowered by the addition of hydrated lime (5 lb.), but re-established by adding 3 lb. lead arsenate, and that a similar reduction was caused by the addition of catalytic sulphur (4 lb.) [*R.A.M.*, xv, p. 518].

In field tests carried out in 1935, however, rather better scab control was given by lime-sulphur (1 in 100) plus catalytic sulphur (4 lb.) than by lime-sulphur alone on four out of five apple varieties. The same held true of sooty blotch [*Gloeodes pomigena*] and fly speck [*Leptothyrium pomi*]. The catalytic sulphur treatment gave much more vigorous foliage and much brighter fruit, with considerably less russeting than did the lime-sulphur alone.

In a study by P. D. Peterson it was ascertained that by resorting to wet grinding sulphur can be ground to a much smaller particle size than is possible with present methods of dry grinding. Preliminary field tests on apples in 1934 with wet-milled sulphur gave promising results, and in 1935 the control of apple scab given in one trial by this product (containing 5 lb. pure sulphur per 100 galls.) was quite outstanding, even though the season strongly favoured infection. In another orchard Stayman, Nero, Paragon, and Rome varieties treated with wet-milled sulphur developed, respectively, 10·9, 10·2, 19·8, and 4·8 per cent. scab, the corresponding figures for another block treated with lime-sulphur (pre-blossom) and flotation sulphur being 10·1, 9, 10·4, and 4·4 per cent.

Adams (J. F.) & Nikitin (A. A.). **A new copper fungicide.**—*Trans. Peninsula hort. Soc.*, xxv, 5, pp. 73–80, [1936].

A new copper fungicide has been developed in Delaware and tested under field conditions during a period of three years. Chemically it is a synthetic copper zeolite, containing approximately 25 per cent.

metallic copper in combination with ingredients which render it non-hygroscopic and non-caustic. It is chemically very stable, leaves no conspicuous residue, adheres so well that stickers are not needed, and causes much less injury than other copper fungicides.

Comparative spraying tests conducted in two apple orchards in 1934 and 1935 [the results of which are tabulated] showed that, generally speaking, the new fungicide gave better control of scab (*Venturia inaequalis*), fruit spot (*Phoma* [*Mycosphaerella*] *pomi*), sooty blotch [*Gloeodes pomigena*], and fly speck [*Leptothyrium pomi*] than any of the standard sprays used. Combined with lime-sulphur or wet-milled sulphur [see preceding abstract] it gave considerable promise as an efficient and economical fungicide, and the data obtained also showed that it reduced fruit russeting to a minimum. For average conditions of scab control a concentration of 1 lb. of the new fungicide per 100 galls. is recommended.

GROVES (A. B.). **Fungicides in relation to foliage injury and fruit yield.**—*Trans. Peninsula hort. Soc.*, xxv, 5, pp. 58–60, [1936].

In discussing spray injury of fruit trees under the climatic conditions prevailing in the Peninsula region of Virginia, the author states that lime-sulphur frequently causes considerable foliage injury and also increases arsenical injury, particularly in wet or humid weather. The wettable sulphurs, as a rule, cause comparatively little injury when used alone, except in very hot weather. Bordeaux mixture sometimes causes injury (especially on the fruit) in cool or humid weather, but a weak mixture (2–4–100 or 3–6–100) is generally safe in Virginia. A great merit of Bordeaux mixture is that it acts as a corrective for soluble arsenic, and should always be used with calcium arsenate whether needed as a fungicide or not.

YOUNG (H. C.) & BECKENBACH (J. R.). **Spreader materials for insoluble copper sprays.**—*Phytopathology*, xxvi, 5, pp. 450–455, 1 fig., 1 graph, 1936.

The effectiveness of a number of insoluble copper compounds as substitutes for Bordeaux mixture has been somewhat disappointing owing to their lack of adhesiveness [*R.A.M.*, xiv, p. 382], and the experiments recorded in this paper were made with the object of finding a spreader that would correct this defect. The materials used were bentonite [ibid., xv, p. 592], wyojel (Wyoming bentonite with a low percentage of magnesium oxide) [ibid., xiii, p. 715], talc, Bancroft clay, and flour with basic copper sulphate, basic copper chloride, and copper phosphate, and the method adopted was to atomize glass slides with the mixture, the deposit after drying and washing being taken up with hydrochloric acid and the copper determined colorimetrically. Wyojel and bentonite gave the best results, and in further tests with basic copper sulphate (2 lb. per 50 galls.) the former at 2 to 10 lb. (the highest tested) gave residues of 94·96 to 98·1 per cent., whereas bentonite gave 95·5 to 96·3 per cent. at between 2 to 4 lb., but less at higher proportions. Wyojel was also superior to bentonite in tests with coposil [ibid., xiv, pp. 591, 683].

READ (W. H.). **Insecticide and fungicide investigations.**—*Rep. exp. Res. Sta. Cheshunt, 1935*, pp. 73–78, 1936.

Good control of tomato leaf mould [*Cladosporium fulvum*: *R.A.M.*, xiv, p. 662; xv, p. 407] and cucumber mildew [*Erysiphe cichoracearum*: ibid., xii, p. 744] was obtained at Cheshunt by adding ½ oz. of a proprietary copper oxychloride powder to a diluted oil emulsion, but in order to obtain results as good as those given by a proprietary copper oxychloride suspension it was necessary to add such quantities of copper oxychloride to the oil emulsion that the deposit on the fruits became excessive. Cuprous cyanide was ineffective against the latter disease.

The incompatibility of shirlan H.B. [ibid., xiii, pp. 10, 496; xiv, p. 9] and petroleum emulsion sprays was ascertained to be due to the solubility of salicylanilide in the petroleum resulting in injury to the plants.

In further tests with the copper-oil spray used at Cheshunt against rose rust (*Phragmidium* sp.) [see above, p. 653] and mildew [*Sphaerotheca pannosa*] an increase in the amount of emulsifying and wetting material (hydrolysed glue) reduced the undesirable foliage marking caused by the spray but also diminished the fungicidal value of the latter. The original mixture of one part of copper oleate dissolved in two parts of cottonseed oil, followed by emulsification with three parts of a 20 per cent. solution of hydrolysed glue, finally gave the best results even allowing for the injury it caused. Of many fungicides tested against rose mildew the combined copper oxychloride and petroleum emulsion now obtainable commercially under the name 'bouisol [ibid., xv, p. 481] and white oil emulsion' gave the best results, the product being used at a dilution of 1 oz. in 5 pts. of water.

MARTIN (H.). **Developments in the chemistry of fungicides used on farm crops.**—*Agric. Progr.*, xiii, pp. 105–112, 1936.

The author reviews the present position of the use of fungicides in agriculture, particularly with regard to Bordeaux mixture (the physical and chemical properties of which are discussed) and dusts designed to replace it, and seed disinfectants. A table is given showing the composition of a number of well-known proprietary seed disinfectant preparations, from which it is seen that a marked reduction has taken place in the mercury content of these from 18 per cent. down to 1·5 per cent. for agrosan G [*R.A.M.*, xv, pp. 558, 565] (tolyl mercury acetate) and ceresan (phenyl mercury acetate).

DILLON WESTON (W. A. R.) & BOOER (J. R.). **Seed disinfection. I. An outline of an investigation of disinfectant dusts containing mercury.**—*J. agric. Sci.*, xxv, 4, pp. 628–649, 1 pl., 8 graphs, 1935.

In preliminary tests of inorganic and some organic compounds of mercury mixed with a filler as seed disinfectants against leaf spot of oats (*Helminthosporium avenae*) and wheat bunt (*Tilletia tritici*) [*T. caries*] the former were valueless, but mercuric phenate and mercuric thiocyanate showed some promise.

Mercuric phenate is of complex chemical composition, but its chief constituents are ortho- and para-hydroxy benzene mercury hydroxide, the acetate of which was chiefly used in further experiments. Whilst this compound was only moderately effective as a seed disinfectant,

the closely similar phenyl mercury acetate [see preceding abstract] was found to be highly efficient. These two compounds belong to the series *R*-Hg-*X*, where *R* is the hydrocarbon ($-C_6H_4OH$ in the former and $-C_6H_5$ in the latter) and *X* is the acidic radicle (acetate in both cases). The results of laboratory and field tests of the effect of compounds in which *R* is represented by four variants (tolyl, phenyl, ethyl, and methyl compounds) suggested that fungicidal power decreases with the increase of the molecule of *R*. The final stage of the investigation consisted of a study of the significance of *X* in the methyl series. For this purpose a range of methyl mercury compounds of varying solubilities was tested for the control of leaf spot and loose smut (*Ustilago avenae*) of oats, leaf stripe of barley (*H. gramineum*), and wheat bunt. The results are given in a series of graphs which indicate the effectiveness of very small quantities of some of the compounds, and judging from their fungicidal values alone, the compounds appear to constitute a range of general specifics against common seed-borne diseases of cereals. No evidence was obtained of stimulation of germination in the sense of tonic effect, and better germination, growth, and crop yields are due not only to control of seed-borne organisms but also to the preservation of food reserves in the seed from attack by soil moulds or other organisms adherent to the seed.

The poisonous nature of this series of mercury compounds was tested on mice and assessed at 1·0 to 1·7 times that of mercuric chloride. An important characteristic of the compounds is their powerful vesicant action in moderate concentrations, but no such action was observed in the preparation of the dusts used in these experiments.

Boutaric (A.) & Boujard (F.). **Actualités. Méthode simple permettant d'évaluer le pouvoir mouillant des solutions et des bouillies utilisées en agriculture.** [Current notes. A simple method for evaluating the wetting power of solutions and mixtures used in agriculture.]—*Rev. Vitic., Paris*, lxxxiv, 2175, pp. 160–162, 1936.

A simple method devised by the authors for calculating the wetting power of a liquid applied to a solid surface (as expressed by the formula $p = \frac{s}{v}$, where p = the wetting power, s = the area covered by each drop of fluid, and v = the volume of each drop) consists in determining by means of a Duclaux pipette the number of drops given by a known volume of the liquid, and hence calculating v, then adding a non-tensio-active colouring agent to the liquid and allowing it to drip from the pipette on to the given surface, the distance of fall being 3·5 cm. A known number of drops (10) is allowed to fall and the surface is slightly moved after each, so that separate spots are obtained. After the liquid has evaporated, the average area of the spots (s) is determined and p evaluated. The wetting power of any liquid in relation to different organs of plants can readily be ascertained by this means, using the particular part of the plant stuck on cork as the solid surface.

Héranger (S. F.). **Sur la mesure du pouvoir mouillant des bouillies.** [On estimating the wetting power of mixtures.]—*Rev. Vitic., Paris*, lxxxiv, 2175, pp. 162–163, 1936.

In discussing the method devised by Boutaric and Boujard for

calculating the wettability of a fluid applied to a solid surface [*R.A.M.*, xv, p. 166 and preceding abstract] the author refers to his own detailed investigation of the subject [ibid., xiv, p. 556] and states that the chief factor determining the wettability of a given fluid is the pressure at which the spray is applied, surface tension being, in comparison, negligible. In practice, it has been found that spreaders do not cause a thin layer of spray to adhere to the sprayed surface and wettability results only from continuous spraying over a period [loc. cit.]. The area covered by the drops is without significance. Large drops falling from the pipette may spread on the sprayed surface, the area covered being proportional to the force of the impact, but this does not apply to very minute drops applied from a spray. Moreover, the technique devised by Boutaric and Boujard is impracticable, as the capillary tube becomes choked with sediment of the suspensions ordinarily used.

VZOROFF (V. I.). Бактерицидные свойства сероводорода. [Bactericidal properties of hydrogen sulphide.]—*Bull. Pl. Prot., Leningr., 1935*, Ser. iii (Control measures and implements), 6, pp. 48–51, 1935. [English summary. Received August, 1936.]

Brief details are given of laboratory experiments in 1934, the results of which showed that exposure of cotton seed infected with *Bacterium malvacearum* [*R.A.M.*, xv, p. 437] to an atmosphere containing 50 per cent. hydrogen sulphide [cf. ibid., xii, p. 106] for 72 hours, and of wheat seed infected with *Bact. atrofaciens* [ibid., xv, p. 297] to 30 per cent. hydrogen sulphide for 48 hours, effectively destroyed the bacteria without undue injury to the seed. Further tests showed that no revival of the organisms occurred after 20 days' storage of the treated seeds. The efficacy of hydrogen sulphide was apparently increased by lengthening the time of exposure rather than by increasing the concentration of the gas in the atmosphere. Aqueous solutions of hydrogen sulphide were highly toxic to the seeds.

KIASHKO (Mme P. I.). Сероводород как фумигант зеленых растений и семян. [Hydrogen sulphide as a fumigant for green plants and seeds.]—*Bull. Pl. Prot., Leningr., 1935*, Ser. iii (Control measures and implements), 6, pp. 52–56, 1935. [English summary. Received August, 1936.]

The [tabulated] results of experiments in 1934 showed that exposure of contaminated seed-grain for 72 hours to atmospheres containing from 300 to 600 gm. hydrogen sulphide [see preceding abstract] per cu. m. entirely killed the spores of barley covered smut (*Ustilago hordei*), covered and loose smuts of oats (*U. levis* [*U. kolleri*] and *U. avenae*), wheat bunt (*Tilletia tritici*) [*T. caries*], and millet [*Panicum miliaceum*] smut (*U. panici-miliacei*) [see above, p. 646] which were present on the seed-grain. *Fusarium culmorum* in pure cultures and *Puccinia triticina* on wheat leaves were also completely destroyed by the same exposure to 300 gm. of the gas in 1 cu. m. When sown in the field, however, hull-less oat seed treated at a concentration of 600 gm. per cu. m. gave 3 per cent. smut infection of the resulting seedlings, and seed treated at 300 gm. per cu. m. gave 34 per cent. infection. Millet seed treated at 300 gm. per cu. m. gave 73·2 per cent. smut infection.

Treatment at 600 gm. per cu. m. concentration did not affect adversely the viability of pea, cucumber, cabbage, and rape seed, but considerably lowered the germinability of soy-bean, hemp, maize, beet, and cotton seeds; the latter effect may be due in part to insufficient aeration of the seeds after treatment, and also to the fact that the hydrogen sulphide used contained traces of hydrochloric acid.

Kvashnina (Mme E. S.). Фунгисидные свойства сероводорода. [Fungicidal properties of hydrogen sulphide.]—*Bull. Pl. Prot., Leningr., 1935*, Ser. iii (Control measures and implements), 6, pp. 57–64, 1935. [English summary. Received August, 1936.]

The results of laboratory tests in 1934 at the Azoff-Black Sea Plant Protection Station, in which wheat, barley, oats, maize, and cabbage seed, contaminated with various parasitic and saprophytic fungi (*Tilletia tritici* [*T. caries*], *Ustilago* spp., *Puccinia* spp., *Fusarium* spp., *Helminthosporium* spp., *Alternaria*, *Aspergillus*, *Penicillium*, and *Botrytis cinerea*), were exposed for periods of from 48 to 168 hours to concentrations of 13·3 to 40 per cent. hydrogen sulphide at temperatures from 8° to 35° C., showed that all the organisms were effectively controlled by the treatment, higher temperatures being more important for the efficacy of the treatment than an increase in the length of exposure or in the concentration of the gas [cf. preceding abstracts]. Field tests showed uniformly good control of the diseases involved; treated seed-grain of the winter wheat Ukrainka gave equal or slightly denser stands than those raised from control seed, a slight decrease in density only occurring with treated seed of the winter wheat Co-operatorka; considerably denser stands were obtained from treated seed of winter barley. In every case the stands given by seed-grain treated with hydrogen sulphide were slightly to considerably denser than those obtained from formalin treated seed. The experiments are being continued in view of the comparative cheapness and ease of application of the treatment and the present shortage of fungicides in the U.S.S.R.

Edelman (N. M.). Действие сероводорода на семена. [Effect of hydrogen sulphide on seeds.]—*Bull. Pl. Prot., Leningr., 1935*, Ser. iii (Control measures and implements), 6, pp. 65–67, 1935. [English summary. Received August, 1936.]

Laboratory tests in 1934 at the Azoff-Black Sea Plant Protection Station, in which the seeds of 24 varieties of field crops (wheat, oats, sunflower, and flax) and of 15 varieties of vegetables were exposed for 24 to 28 hours to atmospheres containing from 200 to 500 gm. hydrogen sulphide [see preceding abstracts] per cu. m., showed that none of the seeds tested was injured by the treatment, except those of tomatoes (the germinability of which was reduced by from 2 to 6 per cent.), while in some cases their germination was increased by from 2 to 10 per cent. and more.

Sparrow (F. K.). **Biological observations on the marine fungi of Woods Hole waters.**—*Biol. Bull. Woods Hole*, lxx, 2, pp. 236–263, 3 pl., 35 figs., 1936.

Descriptions are given of 15 species of Phycomycetous marine fungi

[cf. *R.A.M.*, xiv, p. 59] (including two new genera and two new species, with Latin diagnoses), all collected in the vicinity of Woods Hole, Massachusetts, and with one possible exception, new to the United States, 14 being found on marine algae and one on microscopic animal eggs. The existence of true marine fungi, their work as one of the several types of 'reducers' in the sea, and their potential importance in the formation of marine humus are discussed. It is further mentioned that the species of *Labyrinthula* [ibid., xv, p. 453] associated with the wasting disease of *Zostera* in North America has been observed by the writer in diseased material of the plant from the Kattegat (1933) [ibid., xiv, p. 709] and Plymouth Harbour (1935).

BUDRINA (Mme A.). Методы фитопатологической экспертизы семян. [Methods for the phytopathological examination of seeds.]—*Pl. Prot. Leningr.*, *1935*, 6, pp. 13–22, 1935. [Received July, 1936.]

The author surveys the standardized methods for the phytopathological analysis of crop seeds introduced when the practice was made compulsory over the whole territory of the U.S.S.R. in 1934. The subject is discussed under the headings of external examination of seed samples, and biological and anatomical methods, with an indication of the advantages and drawbacks in each case.

BIRKELAND (J. M.). **On the classification of plant viruses.**—*Phytopathology*, xxvi, 5, pp. 456–458, 1936.

In addition to the criteria proposed by J. Johnson and Miss Hoggan for the classification and diagnosis of plant viruses [*R.A.M.*, xiv, p. 521], recent work indicates that serological and induced immunity reactions [ibid., xiii, p. 545] may also be useful for this purpose, revealing relationships not always apparent from the symptoms displayed by the various hosts. In this connexion mention is made of the common phenomenon of mutation in certain viruses. By growing infected plants at high temperatures or selecting portions of diseased leaves showing varying gradations of colour, it is possible to isolate strains 'breeding true' for these particular features which, if encountered in nature, would undoubtedly be regarded as new and named according to the symptoms observed on their hosts. There is reason to believe that insects act as disseminators of such variant viruses, a multiplicity of which may therefore be expected to arise, characterized at first by divergent symptoms but essentially identical in origin. A table is given, prepared from the author's own data, supplemented by those of Kunkel [ibid., xiii, p. 648] and Caldwell [ibid., xiv, p. 600], demonstrating the striking parallelism between the serological reactions of a number of plant viruses and the degree of acquired immunity from those viruses in plants.

RISCHKOW (L. W.). **Ultravirus und Immunität.** [Ultravirus and immunity.]—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 153–166, 1936. [French summary.]

In this survey of the question of immunity of plants from virus diseases the author states that among plants individual resistance to

virus attack is seldom observed, though some species are resistant to certain viruses. Individual resistance depends largely on the age of the host, plant embryos being resistant to most virus diseases. The majority of plant viruses show little specialization; one and the same virus can attack representatives of different families, although some genera and species may show individual resistance to it. There are instances where immunity is due to the presence of inactivating substances in the sap, e.g., *Datura*, which is naturally immune from tobacco mosaic. Cases of symbiosis between virus and host and of antagonism between viruses have been wrongly interpreted by some workers as evidence of acquired immunity. After recovery from virus infection plants may carry the same virus in a latent state, but no definite proof has yet been produced that plants can show true acquired immunity to diseases caused by filterable viruses.

SMITH (K. M.) & DONCASTER (J. P.). **The particle size of plant viruses.**—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 179–182, 1936. [French summary.]

The authors briefly discuss Elford's method for the calculation of the size of virus particles [*R.A.M.*, xv, p. 306] by means of which the following sizes were determined: potato virus X, 75 to 112 $\mu\mu$; tomato streak virus, 30 to 45 $\mu\mu$; tobacco necrosis virus [ibid., xiv, p. 798], 20 to 30 $\mu\mu$; tobacco virus 1, 18 to 27 $\mu\mu$; and a new tomato virus, 17 to 25 $\mu\mu$ [not 25 to 27 $\mu\mu$, as given in error: ibid., xv, p. 264]. Passage through graded collodion membranes is one means of separating mixtures of plant viruses and even mixtures of strains of the same virus [ibid., xv, p. 122].

AINSWORTH (G. C.). **Virus diseases.**—*Rep. exp. Res. Sta. Cheshunt, 1935*, pp. 56–62, 1936.

The tomato disease characterized by severe leaf distortion of the fern-leaf type and the presence of enations on the underside of the leaves, reported last year from Hertfordshire [*R.A.M.*, xv, p. 264], is now attributed to a strain of tobacco virus 1. The virus is filterable unchanged through Pasteur-Chamberland filters, has a thermal death-point of 90° C., and is resistant to ageing *in vitro*; immunity studies showed that it was incapable of infecting a plant previously inoculated with tobacco virus 1, and mixed inoculations with it and potato virus X on tomatoes resulted in typical mixed virus streak [ibid., xv, p. 535]. The symptoms resemble those of fern leaf of tomato caused by cucumber virus 1, but differ in the leaf enations.

A mosaic disease of watercress (*Nasturtium officinale*), causing yellow mottling and slight deformation of the leaves with slight stunting of the plants, was shown to be due to cucumber virus 1.

An interesting instance of recovery from spotted wilt was afforded by three flowering *Hippeastrum* [*calceolaria*] plants [ibid., xiv, p. 662]. These were severely affected when potted up, and as usual the soil was allowed to dry out, the bulbs being watered again in late autumn; the following spring all three plants appeared to be quite healthy and no virus could be detected in them.

CARTER (W.). **Insects and plant diseases.**—*Proc. Hawaii. ent. Soc.*, ix, 2, pp. 159–170, 2 diags., 1936.

This is a discussion on the relationship between insects and certain plant diseases [*R.A.M.*, xv, p. 241], with special reference to the mealy bug wilt and green spotting of pineapple leaves in Hawaii associated with infestation by *Pseudococcus brevipes* [ibid., xiv, p. 457; xv, p. 451]. Mention is further made of the yellow spot virus of the same host [ibid., xiv, p. 456] and some general comparisons are drawn between the effects of insect-secreted toxins and those of viruses.

BURGES (A.). **On the significance of mycorrhiza.**—*New Phytol.*, xxxv, 2, pp. 117–131, 1936.

From a critical review of the literature and his own observations the author concludes that the presence of the fungus in a mycorrhizal association [*R.A.M.*, xv, p. 520] is to be regarded as an example of controlled parasitic attack without mutualistic significance. For instance, working with *Orchis incarnata* he obtained from the roots enzymatic substances which disintegrated the hyphae, reducing those in culture to a shrivelled, oily mass within three to four days. A similar action probably takes place during the digestion of arbuscles. Ectophytic mycorrhiza, on the other hand, are probably due in part to stimulation by the phosphatides shown by Melin [*R.A.M.*, v, p. 246] to be excreted by the roots. Most of the phenomena associated with mycorrhiza can be interpreted as effects of parasitism and mycorrhizal fungi may be placed in the category of weak parasites controlled by the reactions of the host cells.

Distinct from mycorrhizal activity is that due to soil fungi breaking down the organic matter in the soil into water-soluble components, which thus become available to the higher plant and may be absorbed by its roots in amounts corresponding to the degree of saprophytism. The soil organisms responsible for the decomposition are not necessarily mycorrhizal fungi, but some occur regularly as endophytes in the roots.

CASTELLANI (E.). **Influenza dei prodotti di escrezione di alcuni funghi isolati dall'apparato radicale della Barbabietola sulla germinazione del Mais.** [The influence of the excretory products of certain fungi isolated from the root system of Beet on the germination of Maize.]—*Nuovo G. bot. ital.*, xlii, 4, pp. 614–622, 1935. [Received July, 1936.]

It has frequently been observed in the lower valley of the Po that the growth of maize is adversely affected when planted in association with sugar beet or in rotation with this crop. The author therefore investigated the microflora of the sugar beet roots and in the course of his study isolated *Penicillium* sp., *Cladosporium* sp., *Stysanus stemonites* [*R.A.M.*, xiv, p. 196] in association with *Stachybotrys alternans*, *Mucor mucedo*, *M.* sp., *Macrosporium* [?*Pleospora*] *herbarum*, *Geomyces vulgaris* (possibly identical with *Verticillium monosporioides*) [ibid., xi, p. 641], *Fusarium* sp., *F. orthoceras*, and *Geotrichum candidum* [ibid., xiv, p. 383]. He then ascertained that the fluid from pure

cultures of these organisms reduced the germinability of maize seed, *M. herbarum*, *G. vulgaris*, *F. orthoceras*, *F.* sp., and *G. candidum* being particularly active in this respect. Although in the field wheat appeared to be unaffected by the sugar beets, a similar laboratory test to the foregoing also reduced the germination of wheat seed. Further investigations are in progress.

BUTLER (E. J.). **The nature of immunity from disease in plants.**—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 1–16, 1936. [French summary.]

In considering the problem of plant immunity [*R.A.M.*, xv, p. 389] the author emphasizes that as a rule the reaction of plant tissues is confined to the immediate neighbourhood of the infection site. Inherent or congenital resistance is, with few exceptions, influenced, apparently, by environmental conditions. Five kinds of acquired immunity are distinguished, viz., (1) that which follows an initial infection, and which has been definitely established only in the case of certain virus diseases, (2) local immunity following an initial infection, the recorded examples of which are not very convincing, (3) immunity acquired through vaccination [loc. cit.], in connexion with which it is pointed out that antibodies have not yet been demonstrated to be present in plants, (4) acquired intracellular immunity, and (5) immunity acquired by symbiosis, which may vary if the environmental conditions change.

The author concludes that analogies between animal and plant diseases should be confined within the limits of cellular pathology. In plants acquired immunity (wherever it has been established with certainty) appears to be no more than an intracellular phenomenon. No evidence has yet been produced to show that in plants antiparasitic action takes place at a distance remote from the immediate infection site.

DUFRÉNOY (J.). **Le rôle des amino-acides et des composés phénoliques dans la susceptibilité ou la résistance des plantes aux maladies.** [The role of amino-acids and phenolic compounds in the susceptibility of resistance of plants to diseases.]—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 16–38, 7 figs., 1936.

From his study of the reaction of plant cells to infection the author concludes that the main factor in the establishment of local immunity is the ability of the plant to produce phenolic compounds in the cells. What generally occurs is that in the cells adjacent to those first infected, two series of antagonistic reactions are set up, the relative speed of which determines susceptibility or resistance. In one form of these reactions the cells revert to the meristematic condition [*R.A.M.*, xv, p. 453], in the other phenolic compounds accumulate in the vacuolar solution; both types of reaction may coexist in one cell, at opposite poles. If the phenolic cells become differentiated so rapidly that the parasite cannot set up any nutritional relations with them, immunity results. On the other hand, if the parasite passes through the reacting cells before they become differentiated into phenolic cells, then the infection becomes generalized, and the plant is susceptible.

GÄUMANN (E.). **Les facteurs de la susceptibilité et de la résistance des végétaux aux maladies parasitaires.** [Factors involved in the susceptibility and resistance of plants to parasitic diseases.]—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 39–63, 5 graphs, 1936.

From a review of the factors determining the susceptibility or resistance to disease in plants, the author concludes that in the vegetable kingdom, attack by the parasite is active, and the plant passive, with the result that passive protection is much more important than immunity-reaction, i.e., active defence. In animals and man, on the other hand, the parasite is introduced into the body passively, taking no active part in the process, while the host displays intensely active immunity-reactions. Active defence in such cases is at least equal in importance to passive protection. In addition to the general humoral reaction, which is associated with the blood, the animal kingdom also shows a cellular, local immunity-reaction which probably has close analogies with the local immunity-reactions of plants. Certain plants undoubtedly possess the ability to produce anti-bodies, but these reactions are exclusively local, being restricted to the tissues immediately surrounding the centre of infection. The author considers that pathology is approaching a time when it will be possible to consider plant and animal disease from the same point of view.

CARBONE (D.). **Le reazioni umorali delle piante.** [The humoral reactions of plants.]—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 65–72, 1936. [French summary.]

On the basis of the evidence available the author considers that the formation of true antibodies in plants has not yet been definitely established [cf. *R.A.M.*, xiv, p. 713], and briefly describes known cases of the diffusion of defensive substances into liquids and jellies from plant tissues placed in them *in vitro*; the formation of defensive substances by plants is well established, and pseudo-antibodies should probably be included among them also.

MAGROU (J.). **La phagocytose chez les végétaux.** [Phagocytosis in plants.]—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 73–81, 1936.

Applied to plants, the term phagocytosis is defined by the author as the digestion of microscopic parasites by the cells into which they have penetrated. The process is best known in plants possessing endotrophic mycorrhiza. When the seeds of Orchidaceae are entered by the symbiotic fungus some of them destroy the mycelium by intracellular digestion, thus arresting the invasion; symbiosis then cannot be established, and germination does not occur. This may be compared with the recovery of animals from infectious diseases as a result of the destruction of the microbes by the phagocytes. In other seeds, the 'phagocytes' instead of completely destroying the fungi only delay their advance, and in such cases symbiosis can become established. It is concluded that the phenomenon described as plant phagocytosis may play an important part in plant immunity.

Politis (J.). **Immunité et hérédité chez les végétaux.** [Immunity and heredity in plants.]—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 83–95, 1936.

Discussing the part played by certain chemical substances in the defence of the plant against parasitic diseases the author refers to numerous cases in which parasitic stimulation causes the elaboration of anthocyanic pigments, phenolic compounds, tannoids, and the like, which are all said to exert a toxic action toward the parasite. In the second part of the paper is considered the role of the vacuole in relation to heredity and the elaboration of new materials.

Reed (H. S.). **Cellular nutrition and immunity.**—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 97–106, 1 fig., 1936. [French summary.]

The living constituents of the plant cell are characterized by constant mobility and lability, but the cell tends to maintain its integrity by a continual re-establishment of equilibrium between its constituents. The degree of hydration of the vacuoles determines susceptibility to infection. Dehydration often accompanies the chemical modifications tending to increase immunity in plants; the concentration of salts increases in the vacuoles, the sugars are changed into polysaccharides, pentoses, and other bodies which contain less water and are therefore less readily absorbed by invading organisms. Recent discoveries have shown that plants are able to acquire immunity probably by antibodies, in the formation of which nutrition plays an important part; in other cases immunity may be due to the production of phenolic compounds in the host cells. Significant results have been obtained in experiments with germanium, zinc, and boron in relation to immunity, and further research is needed on this aspect of the problem.

Brooks (F. T.). **The resistance of trees to lignicolous fungi.**—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 135–142, 1936. [French summary.]

Discussing the reactions shown by various susceptible and resistant plum varieties to invasion by *Stereum purpureum* the author states that resistance appears to be associated with the formation of gum barriers [*R.A.M.*, xi, p. 59]. A susceptible variety may become resistant following a change in metabolism. He suggests that gum formation in the xylem plays an important part in the resistance set up to other fungi that attack the sapwood, and considers that the formation of tyloses in the wood vessels may arrest some types of invasion and so play a part in resistance.

Salaman (R. N.). **Immunity to virus diseases in plants.**—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 167–178, 1936. [French summary.]

In this full review of the data regarding immunity from virus diseases in plants, the author contrasts this immunity with that found in animals, commenting on the lack of evidence for the existence of antibodies in plants, and classifies the types of immunity as real or apparent (when plants recover from symptoms but remain infective). A further type is afforded by carriers. True immunity may be local

or systemic; active acquired immunity has been demonstrated but no examples of passive acquired immunity are known. The author concludes that while immunity in animals is largely humoral and only to a minor extent cellular in character, in plants it is largely if not entirely cellular.

Săvulescu (T.). **L'immunité aux maladies bactériennes des plantes.** [Immunity to bacterial diseases of plants.]—*Rep. 3rd int. Congr. compar. Path.*, i, 2, pp. 183–251, 1936.

In the first part of this detailed account of present information on plant immunity to bacterial diseases the author deals with the question of resistance, the chief points discussed being mechanical resistance and physiological resistance, the latter considered under the headings of chemical resistance, resistance by pseudo-antibodies, resistance by intracellular digestion and by other means, and, finally, factors influencing natural resistance. The second part deals with the principles of acquired immunity, and is followed by other sections treating of passive, serological immunity, anaphylaxis, and bacteriophages. The author concludes that while the mechanism of plant immunity is not always comparable with that in animals, there are indications that the same laws govern immunity phenomena in all living things, that the use of vaccines, curative sera, and bacteriophages in the therapy of infectious plant diseases is a problem already solved in theory, and that it is now possible to make a synthesis of the pathogenesis of plant and animal diseases considered from the same point of view, in the general framework of comparative pathology.

A bibliography of 299 titles is appended.

Tilford (P. E.). **The relation of temperature to the effect of hydrogen- and hydroxyl-ion concentration on Sclerotinia fructicola and Fomes annosus. Spore germination and growth.**—*Bull. Ohio agric. Exp. Sta.* 567, 25 pp., 6 graphs, 1936.

The effect of hydrogen-ion concentration on conidial germination in *Sclerotinia fructicola* [*R.A.M.*, xv, p. 161 and above, p. 661] after 24 hours in mannite solutions was found to be closely connected with temperature in respect of the P_H limits for germination, the widest reaction range (1·4 to 7·2) occurring at 21° C. Temperature limits were likewise influenced by the reaction. For instance, at P_H 1·8 and 7·2 germination took place only at a range of 17° to 25°, whereas at from P_H 2 to 6·6, it occurred throughout the scale from 13° to 33°. Germination was inhibited at all reactions at temperatures of either 8° or 40°. The optimum reaction for spore germination was near P_H 2·4 at all the temperatures tested, except at 33°, when a hydrogen-ion concentration of about 5·6 was more favourable. At reactions of P_H 2 and 6·6 germination was most profuse at 21°, while it reached a climax at 24° with reactions of 2·4 and 5·6; at 3·6 the optimum temperature range extended from 21° to 29°. Double maximum germination curves were obtained throughout the experimental temperature range, the minimum coinciding with the isoelectric point at P_H 6 [cf. ibid., ix, p. 197].

Both *S. fructicola* and *Fomes annosus* produced large quantities of acid on potato dextrose and malt agar. Generally speaking, the growth

curves for both fungi followed a straight line throughout the duration of the tests, ignoring the lag phase. The hydrogen-ion was found to be much less toxic to the test fungi than the hydroxyl, the adverse effects of the former being more pronounced at the upper temperature limits for growth and those of the latter in the lower range. *S. fructicola* developed better on potato dextrose than on malt agar, while *F. annosus* preferred the latter. The optimum hydrogen-ion concentrations for *S. fructicola* on potato dextrose agar at 10° to 24°, 25° to 26°, and 27° to 30° were near P_H 3·79, 3·79 to 4·16, and near 5·85, respectively. For *F. annosus* the optimum reactions on malt agar at 20° to 23° and 26° to 40° were P_H 4·91 and 5·32, respectively. The temperature coefficients for both fungi were found to vary greatly throughout the temperature range, being largest near the bottom and smallest towards the top of the scale.

MANIL (P.). **Contribution à l'étude de l'immunité chez les plantes.** [A contribution to the study of immunity in plants.]—Reprinted from *Mém. Acad. R. Belg. Cl. Sci.*, Sér. 2, xv, 49 pp., 8 pl., 1936.

The results of experiments carried out to investigate some of the factors involved in plant immunity showed that stem inoculations with *Bacterium tabacum* and *Bact.* [*Pseudomonas*] *syringae* [*R.A.M.*, xv, p. 515] produced typical lesions for each organism on plants of widely separated genera. In tobacco *Bact. tabacum* was found chiefly in the xylem, the lesions present along the veins being due to the rapid development of zoogloeae at the ends of the neighbouring vessels. In lilac and beans (*Phaseolus* sp.) *P. syringae* chiefly attacked the collenchyma and perivascular tissues. This tropism may explain some cases of natural immunity associated with the anatomical structure of the host. The lowest P_H value tolerated by either organism was about 5·85 and this may account for the immunity of *Pelargonium zonale* (with sap of P_H 4·56) towards these parasites. Osmotic pressure was found to inhibit entirely the development of both bacteria in concentrated solutions whereas the saprophytic *Bacillus coli* and *B. fluorescens* were much less affected. Fresh plant extracts had no marked specific action on either *Bact. tabacum* or *P. syringae*. Power of agglutination of the bacteria by plant extracts was found to be in no way related to natural immunity and the expressed juice of leaves containing *Bact. tabacum* after filtration through Chamberland candles was not toxic. The 'immunity barriers' of necrosed tissue set up in tobacco leaves inoculated with *Bact. tabacum* and *B. fluorescens* were about equally thick. Further experiments indicated that a strictly local and very temporary immunization follows vaccination with *Bact. tabacum* antiserum and that root absorption by bean seedlings of a culture filtrate of *P. syringae* resulted in acquired hypersensitiveness, a kind of special allergy.

BALDACCI (E.). **A proposito della vaccinazione nelle piante superiori.** [On vaccination in the higher plants.]—*Nuovo G. bot. ital.*, xlii, 4, pp. 599–603, 1935. [Received July, 1936.]

With reference to his recently published investigations on the so-called 'vaccination' of plants [*R.A.M.*, xv, p. 389], the author discusses

the views that have been put forward by various workers as to the precise nature of the toxicity of the 'vaccines'. No satisfactory evidence is forthcoming that vaccines have any optimum concentration; it is, moreover, arbitrary to assume that the most toxic doses of a 'vaccine' are necessarily those best adapted for purposes of vaccination, which has to be regarded as an intoxication phenomenon to which the plant reacts by changes in the osmotic pressure of its sap.

REDDICK (D.). **Seed transmission of Potato virus diseases.**—*Amer. Potato J.*, xiii, 5, pp. 118–124, 1936.

In 1934 three or four out of 2,000 potato seedlings in screened cages at Ithaca, New York, showed symptoms very suggestive of acropetal necrosis [*R.A.M.*, xv, p. 459] and later others developed indeterminate pathological features of various types until finally a total of 52 were counted. Five of the tubers from these plants failed to grow, but 39 yielded progeny with similar symptoms to those of the parents, while 8 gave rise to apparently healthy plants. Among 1,500 seedlings grown in 1935, 18 showed symptoms comparable to those observed in the previous year. Inoculation tests with the diseased material on virus-free President plants demonstrated conclusively that the virus concerned was in fact that of acropetal necrosis, most or all of the aberrant types being merely varietal responses to the same infective principle. Evidence is briefly adduced for the transmission of the virus by means of the pollen, but absolutely conclusive proof of this means of communication is not forthcoming.

Potato leaf roll developed in 75 per cent. of the progeny of plants infested in their seedling stage by *Myzus persicae*, the seedlings being raised in proximity to plants affected by leaf roll. Of the three aphids locally concerned in the spread of true leaf roll, viz., *M. persicae*, *Macrosiphum solanifolii* [*M. gei*], and *M. pseudosolani*, the first-named is the most active [ibid., xv, p. 483].

While emphasizing the value of healthy foundation stock for breeding purposes, the writer points out that an affected individual plant of great value may in general be safely used as either parent in hybridization, provided that the first crop of seedlings is grown under insect-proof conditions.

FOËX (E.). **Au sujet de la Pomme de terre et des maladies dites de dégénérescence.** [On the subject of the Potato and of the so-called degeneration diseases.]—*C.R. Acad. Agric. Fr.*, xxii, 14, pp. 573–576, 1936.

The writer fully agrees with Crépin's summing-up of the potato degeneration situation [*R.A.M.*, xv, p. 597] except for his statement on the transmissibility by insects of the diseases responsible for the condition, which has not been proved in the case of mosaic (comprising the common, interveinal, Up-to-Date streak, and top necrosis types [see preceding abstract]). In addition to the relative abundance of aphids, their periods of maximum activity are also of importance in connexion with the incidence of virus infections in a given locality. Great stress must be laid on the absolute necessity of isolated sites for selection plots, the vicinity of fields, market-gardens, or any enclosure containing

Solanaceae or cabbages (on which *Myzodes* [*Myzus*] *persicae* often overwinters), as well as of orchards [cf. ibid., xiii, p. 461] being strictly avoided. Particularly suitable for the purpose are clearings in the midst of softwood forests, since the aphid is not harboured by conifers.

Foëx (E.) & Lansade (M.). **L'action pathogène d'une forme de Fusarium oxysporum isolée de la Pomme de terre.** [The pathogenic action of a form of *Fusarium oxysporum* isolated from the Potato.] —*C.R. Acad. Sci., Paris*, ccii, 21, pp. 1812–1813, 1936.

Disinfected healthy potato tubers of the Institut de Beauvais and Fin de Siècle varieties were planted in pots containing partially sterilized soil inoculated with a form of *Fusarium oxysporum* distinct from the American variety [*R.A.M.*, xv, p. 252] isolated (*a*) from wilted potato plants in Brittany and (*b*) from a tuber sent from Morocco. In about one-fifth of the 70 plants in the inoculated soil foliar wilting (absent in the controls) was apparent; the fungus was detected in the vessels and in the root, collar, and stem parenchyma, reisolated, and again inoculated into a fresh lot of tubers with positive results. The faintly discoloured vascular ring of the tuber is frequently the site of a bacterial rot [see next abstract].

Foëx (E.) & Lansade (M.). **Action pathogène d'une bactérie isolée de tubercules de Pommes de terre.** [The pathogenic action of a bacterium isolated from Potato tubers.]—*C.R. Acad. Sci., Paris*, ccii, 23, pp. 1939–1941, 1936.

From the wet rot in the vicinity of the vascular ring of potato tubers infected by *Fusarium oxysporum* [see preceding abstract] a bacterium, identified by Stapp as *Bacterium xanthochlorum* [*R.A.M.*, v, p. 574], was isolated which induced typical symptoms of decay in tubers inoculated (*a*) by placing a culture on a cut section, and (*b*) by immersing a young tuber (about the size of a walnut) in a bacterial suspension for 30 hours, infection in the latter case taking place through the lenticels. Reisolation was effected in both instances. Positive results were also obtained in inoculations on leaves of potato, tobacco, *Solanum aethiopicum*, *S. rantonnetii* (reisolation from two first-named), pea, broad bean [*Vicia faba*], and haricot [*Phaseolus vulgaris*] (reisolation from last-named). The organism was further inoculated into, and reisolated from, seedlings of *Datura aegyptiaca* Vesl. [*D. fastuosa L.*], *D. ecklonis* Lind., *Hyoscyamus niger*, *S. topiro*, *S. humile*, and *S. nigrum* var. *chlorocarpum*. [A condensed account of these investigations appears in *C.R. Acad. Agric. Fr.*, xxii, 20, pp. 726–730, 1936.]

Bawden (F. C.), Pirie (N. W.), & Spooner (E. T. C.). **The production of antisera with suspensions of Potato virus 'X' inactivated by nitrous acid.**—*Brit. J. exp. Path.*, xvii, pp. 204–207, 1 diag., 1936.

In experiments with purified suspensions of potato virus X [*R.A.M.*, xv, p. 390] no significant difference was detected between the sera of rabbits injected intravenously with the active virus and of those injected with virus inactivated by nitrous acid. Both types of antiserum fixed complement and flocculated with active or inactivated

virus suspensions, but not with the sap of healthy tobacco plants, and both were equally effective in neutralizing the virus *in vitro*.

MANNS (T. F.). **Control of Sweet Potato wilt.**—*Trans. Peninsula hort. Soc.*, xxv, 5, pp. 46–47, [1936].

Sweet potato wilt [or stem rot: *Fusarium batatatis* and *F. hyperoxysporum* (*F. oxysporum* f. 2): *R.A.M.*, xiv, p. 150], which has caused severe losses in Delaware, especially on light soils in hot, dry periods, is stated to disappear when the sweet potato is kept off the land for a time. Control depends on eliminating infection from the seed and then keeping the seed healthy by seed-bed sanitation and rotation. Hill selection at digging is necessary; only medium-sized potatoes should be taken for seed, and they should be stripped, dried, and stored before the main crop is harvested. The practice of 'slipping' (the slips being cut from early plants without wilt or yellowing) is the best preventive of all sweet potato diseases.

STEVENS (N. E.). **Suggestions for a Pacific survey of Rice diseases.**—*Proc. fifth Pacif. sci. Congr., 1933*, iv, pp. 3239–3240, 1935.

In view of the great importance of rice as a staple food in the Pacific countries, the suggestion is made that, with the co-operation of the Plant Disease Survey of the United States Bureau of Plant Industry, a special committee should be appointed to undertake a Pan-Pacific survey of rice diseases.

Appended to this paper (pp. 3241–3246) is a list, compiled by Jessie I. Wood, of the bacterial, fungal, physiological, virus, and nematode diseases and parasitic phanerogams known to affect the crop.

[On p. 3343 it is stated that a resolution was passed voicing the wishes of members of the Congress to initiate a survey of rice diseases on the lines indicated, with the possibility of a subsequent extension of the undertaking to other crops.]

GIESECKE (F.) & LESCH (W.). **Versuche über die Wirkung eines kupferhaltigen Kalkmehls auf die Pflanzenproduktion.** [Experiments on the action of a copper-containing lime powder on plant production.] —*Landw.VersSta.*, cxxv, 3–4, pp. 229–234, 1936.

Mustard plants grown in pots on 'reclamation-sick' soil [*R.A.M.*, xv, p. 493] benefited from applications of a copper-containing lime powder, specially prepared from copper schist by H. Wölbling, at the rate of 14·7 or 29·4 gm. per pot, whereas the same treatment was without effect on those cultivated in a slightly loamy sand.

KOVAČEVSKI (I. C.). Бактериалниятъ пригоръ по италианския Кимионъ. **Phytomonas cumini n.sp.** [Bacterial blight of Cumin, *Phytomonas cumini* n.sp.]—*Bull. Soc. bot. Bulgarie*, vii, pp. 26–44, 3 figs., 1936. [English summary.]

Cumin (*Cuminum cyminum*), the commercial cultivation of which is stated to be a comparatively recent development in southern Bulgaria, is severely attacked there by a bacterial blight affecting all the aerial organs of the plant. The first symptoms, usually appearing at the time of flowering on the stems, leaves, and inflorescences, are in the form

of narrow, green, water-soaked streaks, 2 to 4 mm. long, frequently coalescing together and soon turning brownish-yellow or dark brown, with a greasy appearance, and becoming covered with a white incrustation of bacterial ooze. The yield may be reduced in severe outbreaks by as much as 70 to 80 per cent. The distribution of the blight in the field is chiefly by rain-water. Isolations from diseased material yielded long rods with rounded ends, 1 to 3 by 0·5 to 0·7 μ in diameter, occurring singly, in pairs, or in chains and filaments. On potato agar it forms greyish-white, glistening, smooth, butyrous, circular, entire, and amorphous colonies. The organism is aerobic, Gram-negative, non-sporulating, green-fluorescent in Uschinsky's solution, without typical capsules, with one to three polar flagella (usually at one end only), rapidly liquefies gelatine, slowly peptonizes casein, does not coagulate milk, reduces litmus, does not hydrolyse starch or produce indol, hydrogen sulphide, or nitrates. Its minimum temperature for growth is below 5° C., the maximum about 31°, and the thermal death point about 47°. Its group number is 211.2322133. The bacterium is named *Phytomonas cumini* n.sp., and its pathogenicity to cumin and to dill (*Anethum graveolens*) was demonstrated by inoculation experiments, with subsequent reisolations. It closely resembles some green-fluorescent species of *Phytomonas*, especially *P. apii* [*Bacterium jaggeri*: *R.A.M.*, xiv, p. 143], from which it differs, however, in some cultural characters and chiefly in its pathogenicity.

Dodoff (D. N.) & Načeff (N. p.). Италиянскиятъ Кимионъ въ България (**Cuminum cyminum L.**). (Предварителни бележки). [Cumin (*Cuminum cyminum* L.) growing in Bulgaria. (Preliminary notes.)]—Issued by *Min. Agric. Nat. Domains*, Sofia, 29 pp., 4 figs., 1936. [English summary.]

After a brief historical account of the introduction and cultivation of cumin (*Cuminum cyminum*) in southern Bulgaria, the authors discuss the diseases and pests which were found attacking the crop in 1934 in the vicinity of Assenovgradsk. A peculiar form of degeneration, believed to be caused by a virus, was observed at the Agricultural Experiment Station of Sadovo; it was characterized by a stunted appearance of the plants in scattered and more or less extensive patches in the field. The parts of the plant that develop after infection assume the form of witches' brooms, with small and distorted leaves bearing small, necrotic spots, and abnormal, sterile umbels, and eventually wither. Isolations from diseased tissues consistently remained sterile. Bacterial blight (*Phytomonas cumini*) [see preceding abstract] is stated to be economically the most important disease of the crop. Of the two varieties that are grown, namely, *C. cyminum* vars. *setosum* and *scabridum*, the former is locally considered the more susceptible but the apparent immunity of the latter is probably due to its greater height favouring a more rapid drying up of rain-water and dew. The disease was shown to be carried by the seed and preliminary experiments on seed disinfection have given promising results, but need further elaboration and confirmation. In some cases satisfactory control has been obtained by spraying affected plots with Bordeaux mixture. Powdery mildew (*Erysiphe polygoni*) [*R.A.M.*, xiii, p. 494]

was observed in several fields, in patches up to 15 m. in diameter. Both the conidial and perithecial stages of the mildew occur on the cumin and on the weed *Caucalis latifolia*, from which it is believed to have passed to the former. In moist, low-lying soil, cumin suffers from root rot and isolations from the affected tissues yielded several common soil-inhabiting fungi, such as *Fusarium* and *Rhizoctonia* spp., which, however, have failed so far to reproduce the condition in inoculation tests.

Săvulescu (T.) & Rayss (T.). **Contribution à l'étude de la mycoflore de Palestine.** [A contribution to the study of the mycoflora of Palestine.]—*Ann. Cryptog. exot.*, viii, 1–2, pp. 49–87, 12 figs., 1935. [Received July, 1936.]

This annotated list of 114 fungi collected by the author and other workers in Palestine includes *Sphaerotheca pannosa* on rose, *Podosphaera leucotricha* on apple, *Leveillula* [*Oidiopsis*] *taurica* [*R.A.M.*, xv, p. 587] on artichoke (*Cynara scolymus*), *Exoascus* [*Taphrina*] *deformans* and *Polystigma ochraceum* on almond [ibid., xv, p. 557], *Lophodermium pinastri* [ibid., xv, p. 473] on *Pinus halepensis*, *Septoria apii* on celery, *S. graminum* [ibid., xiii, p. 434] on *Triticum durum*, *S. antirrhini* on *Antirrhinum majus* [ibid., xi, p. 329], *Clasterosporium carpophilum* on peach, *Cercospora lingelsheimi* Săvul. & Rayss. n. comb. [a new name for *C. calotropidis* Lingelsh., the specific name being already occupied] on leaves of *Calotropis procera*, *C. smilacina* forma *asperae* on *Smilax aspera*, *Cercosporina ricinella* on *Ricinus communis* seedlings [ibid., xii, p. 247], *Heterosporium gracile* [*Didymellina macrospora*] on *Iris germanica* [ibid., xiv, p. 698], *Sphacelotheca sorghi* present everywhere on sorghum, *Puccinia asparagi* on asparagus, *P. purpurea* on *Sorghum halepense*, *Phragmidium disciflorum* [ibid., xiii, p. 185] on leaves of cultivated roses, *Uromyces appendiculatus* on cowpea, *U. fabae* on bean (*Vicia faba*) [ibid., xv, p. 552], *U. formosus* on cultivated *Dianthus*, *Tranzschelia* [*Puccinia*] *pruni-spinosae* [ibid., xv, p. 590] on *Anemone coronaria*, almond, myrobolan, and *Prunus pissardi* [*P. divaricata*], *Physopella* [*Cerotelium*] *fici* on fig [ibid., xiv, p. 560], *Melampsora allii-populina* on *Populus nigra* [ibid., xv, p. 529], *M.* [*Melampsorella*] *ricini* on *Ricinus communis* [ibid., iv, p. 590], and *Rhizopogon luteolus* on *Pinus halepensis*. *Helminthosporium palaestinum* n.sp. [with a Latin diagnosis] is recorded as parasitic on stems and leaves of cultivated species of *Dianthus*. The pale or subhyaline, 5- to 7-septate conidiophores arise in bundles of 8 to 16, and measure 30 to 160 by 6 to 8 μ; the conidia are 5- to 7-septate, somewhat straight or curved, tapering towards the apex, pale-olivaceous, and 60 to 120 by 9 to 12 μ.

Chow (C. H.). **A miscellaneous collection of fungi in the National Normal University of Peiping.**—*Bull. Fan Inst. Biol. Peking*, vi, 2, pp. 30–36, 1935. [Chinese summary. Received August, 1936.]

The following are among the items of interest in this annotated list of 32 fungi (mostly edible) collected in different parts of China, for which about half the number are new records. *Cordyceps sinensis* [*R.A.M.*, xi, p. 372], which occurs in profusion in Sikang Province, is

valued for its medicinal properties and some 10,000 kg. are exported annually at $7 Mex. per kg. *Tremella fuciformis*, a product of Szechuan and the vicinity, is esteemed for similar reasons and is rated at $10 Mex. per kg. *Armillaria edodes*, one of the most popular edible fungi of China and Japan, must be differentiated from *A. matsutake* [ibid., xv, p. 554], to which the former name has erroneously been applied. Ito and Imai proposed (*Bot. Mag., Tokyo*, xxxix, p. 319, 1925) to transfer *A. edodes* to *Cortinellus* as *C. berkeleyanus*, but this transference is deemed unacceptable and the name *A. edodes* should, therefore, be retained. *Ustilago zeae* was collected from a female maize inflorescence.

Chow (C. H.) & Chen (H. K.). **On the variation of Ganoderma lucidum (Fries ex von Leysser) Karsten.**—*Bull. Fan Inst. Biol. Peking*, vi, 2, pp. 36–41, 1 pl., 1935. [Chinese summary. Received August, 1936.]

Based on a comparative examination of six Chinese specimens of *Ganoderma lucidum* [*R.A.M.*, xiv, p. 611 *et passim*], the writers give a revised English diagnosis of the fungus, stated to differ from former descriptions only in one feature, namely, the occasional yellow coloration of the subsurface of the pileus. The dimensions of the densely verrucose, brown endospores are given as 8 to 10·5 to 12·5 by 6 to 7·5 to 9 μ. Neither *Fomes japonicus* nor *G. lucidum* var. *japonicum* is considered to differ sufficiently from *G. lucidum* to justify separation and these names should therefore be added to the already existing list of 13 synonyms.

Ling (L.). **Polyporaceae of China listed in the publications of the Science Society of China.**—*Proc. fifth Pacif. Sci. Congr., 1933*, pp. 3246–3250, 1935.

A list is given of the 103 Polyporaceae so far known to occur in various parts of China, with explanatory notes in certain cases. *Fomes fulvus* [*R.A.M.*, xii, p. 302] is stated to be very prevalent in the peach, plum, and cherry orchards of Nanking, Peiping [Peking], and Szechuan. Four new species [without diagnoses] are included in the list.

Raillo (Mme A. I.). Диагностическая оценка морфологических и культуральных признаков у видов рода **Fusarium.** [Diagnostic evaluation of the morphological and cultural characters in the genus *Fusarium.*]—*Bull. Pl. Prot. Leningr., 1935*, Ser. ii (Phytopath.), 7, pp. 5–100, 11 pl., 7 figs., 1935. [English summaries, pp. 37, 78–79. Received June, 1936.]

In the first part of this paper the author indicates the difficulties inherent in Wollenweber's [*R.A.M.*, x, p. 626] and Wollenweber's and Reinking's [ibid., xv, p. 321] classification of the genus *Fusarium*, claiming that these are chiefly due to the fact that most of the characters used by them in establishing their system are casual and insufficient for diagnostic purposes. She then gives a detailed and fully tabulated account of her own studies of the morphological and cultural properties of 17 species of *Fusarium*. All the fungi were studied under standardized conditions on ordinary potato (var. Centifolia) or acid potato agar at 22° to 23° C. in diffuse light, and their pigmentation on

rice or potato slices. The records were made according to a standard method and the results, which were tested statistically, indicated that the only morphological character of diagnostic value distinguishing the species is the shape of the apical cell of the conidia derived from pionnotes, pseudopionnotes, or sporodochia, as the conidia borne on aerial mycelium are too variable to be of any use. Such characters as the curvature of the conidia, the number of septa, width of the conidia, and the length of the apical cell can only serve to distinguish subspecies, varieties, or subvarieties, while cultural characters such as pigment, presence of sclerotia, and mode of spore formation are only indicative of forms. The data thus obtained are used in an attempt to outline a theoretical structure of the species in the genus *Fusarium* comparable with that already introduced into the classification of the phanerogams by Vavilov and other Russian authors, and which in the author's opinion should considerably simplify the present classification of the genus.

In the second part, the author describes her studies on the variability of the morphological and cultural behaviour of different single-spore isolates from single-spore cultures of the different species, the results of which showed that the shape of the apical conidial cell, the prevailing number of septa, and the shape of the curvature of the conidia remain constant in all the isolates derived from single-spore cultures. The length and width of the conidia, on the other hand, as well as the cultural characters, varied considerably in the isolates. On the whole, these results are considered to confirm the relative taxonomic value of the different characters as indicated in the first part of the paper.

Carrera (C.). **Fusarium de la República Argentina. Estudio y clasificación de algunas especies.** [*Fusarium* in the Argentine Republic. A study and classification of certain species.]—*Physis, B. Aires*, xii, 41, pp. 43–47, 1936.

An annotated list is given of ten species of *Fusarium* infecting plants in the Argentine, a preliminary note on which by J. Marchionatto has already appeared [*R.A.M.*, xiv, p. 720].

Sideris (C. P.). **Characteristic plant and fruit diseases of tropical plants caused by Pythiaceous parasites.**—*Proc. fifth Pacif. Sci. Congr., 1933*, iv, pp. 3329–3335, 1935.

Notes are given on the distribution and host range of *Nematosporangium* [*Pythium*] *aphanidermatum* [*R.A.M.*, xiv, pp. 498, 743; xv, p. 587] *P. de Baryanum*, *Phytophthora palmivora*, and *P. parasitica*, followed by an account of certain tropical plant diseases caused by Pythiaceous fungi, particulars of which have been given from time to time in this *Review*. The paper concludes with a brief discussion on the physiological aspects of parasitism by this group of fungi.

Het gebruik van zwavel bij de bestrijding van zwarte wortelschimmel bij de Theecultuur (Rosellinia arcuata en R. bunodes). [The use of sulphur in the control of black root rot in Tea cultivation (*Rosellinia arcuata* and *R. bunodes*).]—*Ind. Mercuur*, lix, 9, pp. 115–116, 1936.

Recent experiments at the West Java Experiment Station (*Korte

Meded. 45) have shown that the ordinary method of sulphur application (by strewing) for the control of *Rosellinia arcuata* and *R. bunodes* in tea plantations [*R.A.M.*, xii, p. 425] should be replaced by the more economical practice of mixing the disinfectant with the soil in the plant holes. It is not necessary to dig holes larger than $\frac{1}{15}$ to $\frac{1}{12}$ cu. m. and the quantity of sulphur required per hect. is about 1,270 kg. for a spacing of 3 by 4 ft. or 760 kg. for one of 4 by 5 ft., costing Fl. 64 or 38, respectively. The corresponding figures for the strewing method are 5,000 to 10,000 kg. sulphur per hect. (Fl. 250 to 500). More thorough eradication of old root stumps is also advocated.

Van der Meer Mohr (J. C.). **Verslag van het Deli Proefstation over het jaar 1935.** [Report of the Deli Experiment Station for the year 1935.]—*Meded. Deli-Proefst.*, Ser. 2, xciv, 53 pp., 1936.

The following are among the items of phytopathological interest in this report. Rotterdam B disease [*R.A.M.*, xv, p. 403] occurred in a virulent form in newly transplanted tobacco and the available evidence is now stated to point definitely to its transmission through the soil.

The incidence of slime disease [*Bacterium solanacearum*: ibid., xiv, p. 658] was reduced by 19 per cent. by cultivation on ground previously occupied by *Mimosa* [*invisa*: ibid., ix, p. 349] and lalang [*Imperata arundinacea*], which is regularly burnt off, whereas an increase of 24 per cent. was observed in the plots following the broad-leaved *Macaranga tanarius*. Moderate applications of lime were also beneficial in minimizing the amount of slime disease, but the advantages of this treatment are counteracted by its tendency to deplete the potash content of the soil and to cause top rot, the cure of which necessitates three applications of 6 mg. boric acid per plant [ibid., xiii, p. 659]. Sulphur was only effective when applied to the soil in such quantities as to induce a strongly acid reaction (P_H 4·5 or thereabouts), whereby the essential nutrient elements are exhausted and a reasonably good harvest becomes impracticable. The beneficial effect of single superphosphate on slime disease in tomato seedlings [ibid., xiv, p. 658] was found to be connected with its high (50 per cent.) gypsum content.

Thung (T. H.). **Phytopathologische waarnemingen.** [Phytopathological observations.]—*ex* Jaarverslag i Mei 1934–30 April 1935.—*Meded. Proefst. vorstenl. Tab.* 82, pp. 27–35, 1936.

Mosaic was again responsible for severe damage in the Vorstenland (Java) tobacco plantations [*R.A.M.*, xv, p. 533] during the period under review, but an improvement in the situation seems likely to result from the use of a 4 per cent. formalin solution for cleansing the coolies' hands prior to thinning out the seedlings and transplanting. Studies are in progress on the mode of dissemination of the special form of mosaic characterized by wispy leaves [ibid., xiii, p. 806], in the transmission of which insects are believed to be involved. Extensive soil infestation was responsible for virulent attacks of *Phytophthora* [*parasitica nicotianae*: ibid., xiv, p. 533], which was evidently distributed with insufficiently fermented stable manure as well as by means of water. Soil disinfection with chemicals proved impracticable.

Of the various methods tested for the control of mildew (*Oidium*) [*Erysiphe cichoracearum*: loc. cit.], the application of sulphur to the soil gave the most promising results, delaying the appearance of the fungus though not preventing its ultimate development. Spraying the plants with shirlan [cf. ibid., xii, p. 744] was effective on a small scale but its extended use was not found to be feasible.

Confirmation was obtained of the correlation observed in previous years between precipitation and the outbreak of leaf spot [*Cercospora nicotianae*: ibid., xv, p. 403], the disease being practically absent in a season of almost unbroken drought preceding the commencement of the rains at the end of October.

VINSON (C. G.) **Virus diseases of plants. Purification of the virus of mosaic disease of Tobacco.**—*Res. Bull. Mo. agric. Exp. Sta.* 237, 16 pp., 1936.

In continuation of his studies on the precipitation of viruses by safranin [*R.A.M.*, xii, p. 332] the author describes a series of experiments, the results of which showed that with increasing concentrations of safranin the virus of tobacco mosaic from the sap of diseased plants was progressively carried down until precipitation was approximately complete. Acetone precipitation of the virus in the fraction obtained on decomposing the safranin precipitate [ibid., viii, p. 407] gave incomplete results, but re-precipitation of the virus with safranin was successful. A few drops of a normal solution of aluminium sulphate precipitated the virus from the fraction obtained on decomposing the safranin precipitate, as also did careful acidification; such precipitates were readily dispersed by lowering the hydrogen-ion concentration. The nitrogen content obtained in the virus fraction from 500 c.c. of juice of diseased tobacco plants, using the lead acetate procedure, was about 10 mg.; very little or no nitrogen was detectable in corresponding samples from healthy plants [ibid., xi, p. 406]. Hydrogen sulphide was found capable of decomposing the lead acetate-virus precipitate suspended in a dilute solution of neutral phosphate without injury to the virus. In a test of the effect of ageing on the various preparations, the lead and safranin precipitates still yielded highly infectious fractions after six months.

MOORE (E[NID] S.) & SMITH (A. J.). **Pests and diseases in Tobacco seedbeds. II. Disinfecting seed and seedlings.**—*Fmg S. Afr.*, xi, 122, pp. 194–195, 1 fig., 1936.

Directions are given for the disinfection of tobacco seed against wildfire [*Bacterium tabacum*] and virus and other diseases [*R.A.M.*, xv, p. 613] by immersion for 15 minutes in 1 in 16 commercial formalin at the rate of 1 oz. per 4 oz. seed, and the selection, preparation, and care of seed-beds, including soil sterilization by various methods adapted to the particular end in view, and frequent applications of 4–4–50 Bordeaux mixture plus lead arsenate ($1\frac{1}{2}$ oz. per 4 galls. spray); 3 galls. of spray should amply suffice for the requirements of 10 sq. yds. of seed-bed for the duration of the season. In the light of present knowledge of the 'kromnek' disease it is advisable to choose sites for tobacco beds at a safe distance from flower and vegetable gardens,

especially those containing potatoes and onions. The most extensive spread of mosaic is liable to occur at the time of transplanting, when all diseased plants should be rogued and the bed sprayed with Bordeaux mixture.

Güssow (H. T.). **Plant quarantine legislation—a review and a reform.**—*Phytopathology*, xxvi, 5, pp. 465–482, 1936.

Following a critical review of the present status of plant quarantine legislation as reflected in the three outstanding measures now in operation—the total embargo, health certificates, and restrictive regulations—the writer suggests the adoption of certain far-reaching reforms, including the organization in all countries of adequate plant disease surveys, stringent supervision of exports, improved methods of port-of-entry inspection, agreements among groups of countries of similar commercial interests and geographical location, international co-operation in scientific research, and the establishment, under the auspices of the League of Nations, of an international advisory council on plant quarantines.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, viii, 2, p. 57, 1936.

Chile. An amendment of 29th May, 1935, to the plant protection regulations of 31st December, 1924, permits the importation from the United States under appropriate safeguards of peach plants free from peach yellows, rosette, and little peach.

Resolución suprema del 3 de enero de 1936 prohibiendo la importación de plantas de Plátano. [A supreme Decree of 3rd January, 1936, prohibiting the importation of Banana plants.]—*Sanid. veg. Min. Agric. Peru*, p. 122, 1936.

In order to prevent the introduction into Peru of the Panama disease of bananas (*Fusarium* [*oxysporum*] *cubense*) the importation of all banana plants or parts thereof is absolutely prohibited as from 3rd January, 1936.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, x, 6, pp. 129–131, 133–134, 137, 1936.

Australia (Commonwealth of). Quarantine Proclamation No. 4 P of 17th September, 1935, contains a list of 124 fungi, bacteria, and viruses the exclusion of which from Australia it is proposed to effect by prohibiting the importation of any articles likely to harbour these organisms, except in accordance with the Quarantine (Plants) Regulations.

Spain. Details are given of the regulations embodied in a Decree of 31st January, 1936, defining the scope and functions of the Spanish phytopathological inspection service, which will be responsible for the examination of agricultural products both for import and export.

Peru. A Resolution of 2nd January, 1936, prohibits the exportation from mosaic-infested sugar-cane plantations of the Santa Catalina Valley [ibid., xiv, p. 736] of cuttings either for planting or consumption in other parts of the Republic or for the market.

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XV NOVEMBER 1936

MALCOLM (D. H.). **Virus diseases of Tobacco.**—*Tasm. J. Agric.*, N.S., vii, 2, pp. 57–60, 3 figs., 1936.

During the past season severe losses from tomato spotted wilt [*R.A.M.*, xiv, p. 129; xv, p. 324] were sustained by tobacco planters in the Derwent Valley of Tasmania. The symptoms and etiology of the disease (the diagnosis of which is stated to have been confirmed by H. R. Angell) are described in popular terms, with practical recommendations for its control.

During the season of 1934–5 some 20 per cent. of the plants in the same district were affected by mosaic, the severity of which, however, appears to have recently declined.

TROTTER (A.). **Il 'verderame' dei Tabacchi in cura.** ['Verderame' of curing Tobaccos.]—*Boll. tec. Tab.*, xxxiii, 2, pp. 67–72, 4 pl., 1936. [English summary.]

Two types of the greenish-blue discoloration known as 'verderame' [verdigris] have been observed on curing tobacco in Italy, viz., the speckled and spotted, the former consisting of minute spherical or angular lesions, 1 to 2 mm. in diameter, distributed in rows along the parenchyma in proximity to the veins, and the latter of larger (up to 1 cm.), circular, slightly raised spots, of a less vivid colour than the foregoing, and not localized on any special part of the leaf. This condition would appear, from the writer's observations, to be a sequel to severe field infection by mosaic and other forms of infectious chlorosis.

BÖNING (K.). **Massnahmen zur Bekämpfung des Wildfeuers an Tabak.** [Measures for the control of Tobacco wildfire.]—*Dtsch. landw. Pr.*, lxiii, 21, pp. 261–262, 7 figs., 1936.

The measures found efficacious by the writer in the control of tobacco wildfire [*Bacterium tabacum*] at the Bavarian Agricultural Institute, Munich, have already been summarized from another source [*R.A.M.*, xv, p. 61].

SMALL (T.). **Diseases of outdoor-grown Tomatoes in Jersey.**—*J. Minist. Agric.*, xliii, 2, pp. 117–124, 5 figs., 1936.

The most serious disease of outdoor tomatoes in Jersey, where about 1,800 to 2,000 acres are planted every year, is blight (*Phytophthora infestans*) [*R.A.M.*, xv, p. 556], which occurs regularly and has been

shown experimentally to pass from tomato to potato and from late, but not readily from early, potatoes to tomato.

Stem rot (*Didymella lycopersici*) [ibid., xiii, p. 403] comes next in importance to blight, and occurs at a critical period when the plants bear three or four trusses of ripening fruit. In most cases death rapidly ensues, the numbers killed on three experimental plots each of 300 plants in 1934, for example, being 110, 137, and 152, respectively. The disease also attacks the fruits on otherwise healthy plants, causing fruit drop, and a pycnidial stage resembling that of *D. lycopersici* was found on potato stems at the end of the season. Control measures are indicated, including the use of seed from healthy plants only, and other plant sanitation methods [ibid., xii, p. 663].

Damping-off is caused by species of *Phytophthora* and by *Corticium solani*; foot rot, caused by the latter fungus, occurs after the seedlings have been planted in the field. Leaf mould (*Cladosporium fulvum*) [ibid., xiv, p. 79] causes damage only in sheltered, low-lying, moist areas. Wilt (*Verticillium albo-atrum*) [ibid., xiv, p. 283] is now rare, as a result of the disinfection of the canes with formaldehyde. Grey mould (*Botrytis cinerea*) is always present, but serious only in wet seasons. Other diseases recorded are the three physiological disorders, blossom-end rot [ibid., xv, p. 537], green back [ibid., xiii, p. 663], and blotchy ripening [ibid., xv, p. 539]; leaf spot (*Septoria lycopersici*) [ibid., xiv, p. 492], target spot (*Macrosporium* [*Alternaria*] *solani*) on the young foliage [ibid., x, p. 564; xiv, p. 563], spotted wilt [ibid., xiv, p. 492], *Sclerotinia sclerotiorum*, which occurs occasionally both on indoor and outdoor crops, the root rots caused by *Thielaviopsis basicola* [ibid., xv, p. 613] and *Colletotrichum atramentarium* [ibid., xi, p. 767], and the fruit rots caused by *Pleospora herbarum*, *A. tenuis*, and *Fusarium equiseti*.

GUBA (E. F.). **Resistance to Cladosporium fulvum.**—*Phytopathology*, xxvi, 4, pp. 382–386, 1936.

The author gives a concise, fully documented survey of the progress made in the development of tomatoes resistant to *Cladosporium fulvum* [*R.A.M.*, xv, p. 481], and concludes that there are good prospects of bringing this important commercial enterprise to a successful conclusion. A bibliography of 37 titles is appended.

BRIEN (R. M.) & CHAMBERLAIN (E. E.). **Tomato seedling damping-off. I. Control by soil treatment.**—*N.Z. J. Agric.*, lii, 5, pp. 257–267, 5 figs., 1936.

Tomato seedling damping-off, associated with *Pythium ultimum* and *Corticium vagum* [*C. solani*: *R.A.M.*, xii, pp. 232, 643; cf. also xiv, pp. 383, 671], of which the former is the more prevalent and injurious, has for some years been a troublesome disease in New Zealand, where it was first recorded in 1924. In tests [the results of which are tabulated] of a large number of soil treatments complete control was given in all cases by steam sterilization, with no ill effect on germination; formalin (1·25 per cent. solution) also gave complete control, but slightly delayed germination, probably because insufficient time was allowed to elapse between soil treatment and sowing; mercurous chloride (0·067 per cent.

suspension) controlled *C. solani* but not *P. ultimum*, and was injurious to the seed; acetic acid (1 per cent.) gave partial control of both fungi; and the other substances were inferior.

Of the treatments tested only steam disinfection and the application of 1·25 per cent. formalin solution are recommended. With the former, a temperature of from 180° to 200° F. for 20 minutes is effective. Where steaming facilities are not available the formalin treatment may be substituted, the soil being saturated, and the excess solution drained off; the soil should then be allowed to stand and be occasionally turned over until all odour of formaldehyde has evaporated, this requiring at least two weeks.

GOIDÀNICH (G.). **Intorno ad una 'Phytophthora' causante un marciume del colletto nel Pomodoro.** [On a *Phytophthora* causing a collar rot in the Tomato.]—*R.C. Accad. Lincei*, xxiii, 7, pp. 512–514, 1936.

Phytophthora parasitica is believed to be the agent of a virulent chestnut-coloured collar rot of tomato seedlings [*R.A.M.*, xiv, pp. 194, 263; xv, p. 615] near Rome, first observed in the spring of 1935. The papillate sporangia of the fungus measured 27 to 46 by 22 to 39 μ (average 36 by 28 μ). On a maize meal medium at P_H 6·11 the flocculent, dendroid colonies attained a diameter of 25 to 30 mm. in 96 hours at 35° C., and one of 3 to 8 mm. at 37°. These particulars are in agreement with Tucker's observations on *P. parasitica* [ibid., xii, p. 594]. It was found impossible to induce the reproductive phase. Mutants differing from the parent colonies in cultural and physiological features developed in one culture of the fungus.

Infection was contracted by plants inoculated in the greenhouse at 20°, but the actual symptoms of the disease were not reproduced, probably on account of the relatively low temperature.

The disease was readily controlled in the seed-bed (it did not spread to the field) by the incorporation in the irrigation water of a small quantity of copper sulphate.

GAGE (G. R.). **A second report on the status of the Dutch Elm disease.**—*J. Tenn. Acad. Sci.*, xi, 2, p. 141, 1936.

The number of elm trees affected by the Dutch disease [*Ceratostomella ulmi*] in the United States [*R.A.M.*, xv, p. 328] up to 15th November, 1935, is given as follows: New Jersey, 9,079 (corresponding figure up to 10th October, 1934, 4,940), New York 4,762 (2,420), Connecticut 132 (56), Ohio, Indiana, Maryland, and Virginia (together) 35 (17), making a total of 14,008 (7,433).

COLLINS (C. W.), BUCHANAN (W. D.), WHITTEN (R. R.), & HOFFMANN (C. H.). **Bark beetles and other possible insect vectors of the Dutch Elm disease Ceratostomella ulmi (Schwarz) Buisman.**—*J. econ. Ent.*, xxix, 1, pp. 169–176, 1936.

After describing the life-histories of *Scolytus multistriatus* and *Hylurgopinus rufipes*, which are stated to be particularly well adapted on biological grounds to the transmission of *Ceratostomella ulmi* from diseased to healthy elms [see preceding and next abstracts], the writers

give details of experiments to determine the part played by these and other insects in the conveyance of the fungus from tree to tree. From the data presented it is apparent that infection was transmitted only by *S. multistriatus* and *H. rufipes*, *C. ulmi* being recovered from previously healthy trees on which the beetles were allowed to feed, from egg galleries made in previously non-infected logs by the insects after contact with diseased material, and from adults (6 out of 29 *S. multistriatus* and 1 out of 14 *H. rufipes*) collected while crawling on elms in the field in 1935 in heavily infested areas of New Jersey. Six trees infected by *C. ulmi* bore no evidence of attack by either bark beetle and one contained only one gallery of *H. rufipes*.

Brief notes are given on the progress to date in combating the disease by means of sanitation plots, chemical treatment of elm stumps, and insecticides.

WORTHLEY (L. H.). **Progress in Dutch Elm disease eradication.**—*J. econ. Ent.*, xxix, 1, pp. 176–181, 1936.

Of the 18 elms infected by *Graphium* [*Ceratostomella ulmi*: see preceding abstracts] detected during the summer of 1935 in cities remote from the major infected area [*R.A.M.*, xv, pp. 129, 326], 10 were in Indianapolis [Indiana], 2 each in Cleveland [Ohio] and Norfolk [Virginia], 1 at Portsmouth in the same region as the Norfolk infection, and 3 at Brunswick, Maryland, the last-named centre constituting the only new isolated focus disclosed by the current year's scouting activities. The number of trees definitely diagnosed in 1935 as harbouring *C. ulmi* was 6,036, nearly 400 fewer than in 1934, and only 39 in which the presence of the disease was recently confirmed remained standing at the end of October. Since the discovery of Dutch elm disease in the United States in 1930 the total number of cases of infection amounts to 13,969. As a result of the 1935 inspections, the known infected zone has been extended by 47 per cent., the largest proportional increase being in New York. All diseased elms found in the tri-State area outside the previous year's infected zone are within a 50-mile radius of Columbus Circle in New York City.

GRAVES (A. H.). **Forest pathology.**—*Rep. Brooklyn bot. Gdn, 1935* (*Brooklyn bot. Gdn Rec.*, xxv, 2), pp. 62–75, 1 pl., 1936.

In these further notes on the hybrids between Japanese and Chinese chestnuts (*Castanea crenata* and *C. mollissima*) resistant to blight (*Endothia parasitica*) and the American chestnut (*C. dentata*) [*R.A.M.*, xiv, p. 611] it is stated that the best hybrid so far obtained, a Japanese-American, is now four years old and stands 11 ft. 2 in. high, compared with a normal height of 4 ft. for an American chestnut of the same age. There are 116 hybrid trees now being grown at Hamden, representing eight combinations of chestnut species and varieties. During 1935 successful crosses have been made, *inter alia*, between three Smith hybrids 1931 and *C. mollissima*, 10 Japanese forest type (*C. crenata* var.) and American chestnut, 1 *C. crenata* var. and Chinese chinquapin (*C. seguinii*), and 15 'S 8' (apparently a combination of *C. crenata* and *C. pumila*) and American chestnut.

Strong (F. C.). **Maple wilt.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xviii, 4, pp. 225–227, 1936.

Maple wilt caused by an unidentified species of *Verticillium* [cf. *R.A.M.*, xiv, p. 265] has become prevalent during the last ten years in Michigan, where the kinds most commonly attacked are the hard maples and Norway maple [*Acer platanoides*], though box-elder [*A. negundo*], red maple [*A. rubrum*], and sometimes silver maple [*A. saccharinum*] are also susceptible. The symptoms vary considerably with the variety and condition of the tree and other factors. Leaf wilt is fairly common but the leaves soon die and drop off. The branches often die during the dormant season. The presence of a dark green discoloration in the wood is an almost certain indication of the presence of the fungus [ibid., xii, p. 338]. The application of fertilizers in early stages of the disease, accompanied by ample watering where necessary, resulted in a marked, but possibly only temporary, improvement in growth.

Bongini (Virginia). **Revisione critica di alcuni micocecidi dell' Ontano.** [A critical revision of certain gall-producing fungi attacking Alders.]—*Boll. Lab. sper. e Reg. Oss. Fitopat. Torino* [formerly *Difesa Piante*], xiii, 1–2, pp. 1–10, 2 graphs, 1936.

In her study of the Exoasceae attacking alders in Italy the author points out that by general agreement among recent workers all the Exoasceae found on this host belong to *Taphrina*, of which five species have been recorded as producing leaf galls, viz., *T. tosquinetii*, *T. sadebeckii*, *T. epiphylla*, *T. borealis*, and *T. klebahni* [*R.A.M.*, xiii, p. 453]. Both *T. borealis* and *T. epiphylla* are, however, regarded as synonyms of *T. sadebeckii*, which is distinguished from *T. tosquinetii* by dimensions of the asci. In 1935, *T. sadebeckii* was common on alder leaves in Piedmont.

Cone galls measuring 0·5 to 2·5 or 3 cm. in diameter are produced by *T. alni-incanae* [ibid., vi, p. 762] which differs from *T. tosquinetii* in having sessile asci. The latter does not occur on the cones. *T. alnitorqua* Robins is synonymous with *T. alni-incanae*, while *T. alnitorquus* Tul., which has been thought to be a synonym of *T. alni-incanae*, is really synonymous with *T. tosquinetii*.

Langner (W.). **Untersuchungen über Lärchen-, Apfel- und Buchenkrebs.** [Investigations on Larch, Apple, and Beech canker.]—*Phytopath. Z.*, ix, 2, pp. 111–145, 10 figs., 1 diag., 1936.

A tabulated account is given of the writer's investigations to determine the correctness or otherwise of Day's theory that larch canker is primarily due to frost injury [*R.A.M.*, xi, p. 140], *Dasyscypha willkommii* [ibid., xv, p. 618] being without appreciable importance in the etiology of the disease. The experimental portion of the work was carried out at the Bavarian Forestry Experiment Station, Munich, and supplementary studies were made at the Kaiser Wilhelm Plant Breeding Institute, Müncheberg.

Evidence was obtained that the fungus cannot penetrate the living tissues under any circumstances and Day's observation that every

case of larch canker is initiated by frost injury to the cambium was fully confirmed, though the author cannot subscribe to the opinion that *D. willkommii* is entirely devoid of significance in the disturbance. As soon as the vital activities of the cortex cease in the autumn, the fungus is able in fairly warm weather to secrete an enzyme and so to disorganize but not to kill the adjacent healthy tissue. With the advent of frost the tissue so affected is killed and into it the fungus penetrates saprophytically. If the weather continues mild a further frost-sensitive zone may be formed and the process repeated several times, especially in the spring. On the basis of these investigations, therefore, *D. willkommii* cannot be designated either as a parasite, a perthophyte [ibid., ix, p. 47], or a pure saprophyte [ibid., vii, p. 210], and the writer has therefore coined to express its activities the term 'thryptophyte'. To this category in future should be referred all fungi acting in such a manner on the host as to enhance its vulnerability to external agencies, which pave the way for actual fungal penetration.

The frost-sensitive zone arises through the conversion of osmotically active cell substances into relatively inactive tannin, involving a significant reduction in the osmotic concentration of the tissue and an accompanying loss of resistance to frost. At the same time there is an appreciable influx towards the cankered zone of plastic substances and water. The advance of the fungus is not generally arrested by the cork layer unless the latter is so far raised above the living tissue as to create a gap between the healthy and infected portions.

The cankers of apple and beech caused, respectively, by *Nectria galligena* and *N. ditissima* [ibid., xiii, p. 732], bear a general resemblance to that of the larch, but no decision was reached as to the interaction of frost and fungal infection in these diseases.

OWENS (C. E.). **Studies on the wood-rotting fungus, Fomes pini. II. Cultural characteristics.**—*Amer. J. Bot.*, xxiii, 4, pp. 235–254, 6 pl., 1 graph, 1936.

Continuing his studies on *Fomes* [= *Trametes*] *pini* [*R.A.M.*, xv, p. 543], the writer tabulates and discusses the variations in cultural characters in 80 isolations of the fungus from six genera and 19 species of coniferous hosts.

Three main groups, each containing minor variations, were differentiated on the agar media used (malt, potato dextrose, oat, and maize meal), viz., (*a*) a majority group including isolations from *Larix occidentalis, Pinus contorta, P. lambertiana, P. monticola, P. palustris, P. resinosa, P. strobus, P. taeda, Picea rubra, P. sitchensis, Pseudotsuga taxifolia*, and *Tsuga mertensiana*, characterized by a rapid growth rate and thick, flocculent, predominantly buff-coloured colonies on malt agar; (*b*) isolations from *Abies grandis*, differing from the foregoing in their relatively slow growth and sparser, somewhat darker-coloured mycelial mats; and (*c*) a third category, comprising isolations from *Pinus ponderosa* and *T. heterophylla*, which are similar to those of (*a*) in growth rate but differ from them in the deeper brown colour and more compact, felty texture of the mycelium.

On wood blocks of *Pseudotsuga taxifolia* extensive delignification was caused by strains of the fungus from the same host, *Picea sitchensis*,

and *Pinus monticola*, whereas the wood was not attacked by those from *A. grandis* and barely touched by the isolations from *P. palustris* and *T. mertensiana*. On *A. grandis* blocks, isolations from *P. palustris* and *T. mertensiana* caused the most delignification, followed by those from *A. grandis*, while the *P. monticola*, *Pseudotsuga taxifolia*, and *Picea sitchensis* strains were much less active in this respect.

The habit of growth of *F. pini* on *A. grandis* and the cultural characters of isolations of the fungus from this host indicate that the latter is distinct from that on various other conifers and from that on some other species of *Abies*, but the available evidence is insufficient definitely to identify the *A. grandis* form as *F. pini* (Thore) Lloyd var. *abietis* Karst.

Inoculations on living trees were unsuccessful, possibly because of the extensive impregnation of the heartwood by resin in the young material used.

GISTL (R.). **Zur Physiologie des 'echten Hausschwammes' (Merulius lacrymans domesticus Falck).** [On the physiology of the 'true dry rot fungus' (*Merulius lacrymans domesticus* Falck).]—*Arch. Mikrobiol.*, vii, 2, pp. 177–187, 2 graphs, 1936.

Nitrates at concentrations up to 0·5 mol. (optimum 0·3) were found to constitute the best sources of nitrogen for *Merulius lacrymans* in wheat chaff cultures, ammonium salts giving a yield only one-third as large. Sulphates at 0·5 mol., calcium salts up to 0·3, and magnesium salts up to 0·1 also promoted growth. *M. lacrymans* produced large quantities of growth-promoting substances [*R.A.M.*, xv, p. 309] in these tests, the yield of yeast cultures being raised 3,300 times in relation to the untreated controls by the introduction of an aqueous extract of the dry rot organism.

BRYAN (J.). **Methods of applying wood preservatives. Part I. Non-pressure methods.**—*For. Prod. Res. Rec., Lond.*, 9, 17 pp., 4 figs., 1 diag., 2 graphs, 1936.

Concise instructions are given for the impregnation of constructional timber by three methods, viz., the more or less superficial brush treatment, steeping, and the open tank hot and cold process [cf. *R.A.M.*, x, p. 700; xi, p. 815; xv, p. 332, *et passim*].

FROSCH (C. J.). **Chemical studies of wood preservation. VIII. The correlation of the distillation range with the penetration of creosote into paper strips.**—*Physics*, vii, 5, pp. 167–178, 1 diag., 4 graphs, 1936.

Measurements of the penetration tensions in paper of a series of creosotes distilled from a single coal-tar [*R.A.M.*, xiv, p. 806] are reported, the penetration tension being the product of the surface tension and the cosine of the contact angle, which in the case of creosote is shown to be zero or extremely minute. Possible errors in the paper strip method are discussed and the importance of calibrating each strip with a reference liquid (benzene was used in these experiments) is demonstrated. The penetration tensions of these creosotes remain unchanged in the presence of adsorbed water.

Zhavoronkova (Mme I. P.). Бактериоз Цветной Капусты. [Bacteriosis of the Cauliflower.]—*Pl. Prot. Leningr., 1935*, 6, pp. 116–126, 4 figs., 1935. [Received July, 1936.]

Cauliflowers (usually grown in the greenhouse in the neighbourhood of Leningrad) are stated to be severely attacked, especially in moist years, by *Bacterium maculicola* McCulloch [*R.A.M.*, xv, pp. 4, 70]; the disease first came into prominence in that region, as well as in Crimea and the Caucasus, in 1930 and 1931, when the local agricultural authorities started enforcing the production of home-grown cauliflower seed. Field observations and controlled infection experiments showed that the plants may be attacked at any stage of development; in greenhouses, the first symptoms usually appear on the leaves, but in certain years the heads may be the first to show the signs of infection. On plants left over for seed, all parts of the flowering shoots are attacked, and the bacterium eventually penetrates the seeds which become black. In the greenhouse artificial infection of healthy cauliflower leaves and heads only succeeded at a temperature of 25° to 26° C. Further tests showed that the disease is transmitted by the seeds and to some extent through the soil. Good commercial control was obtained by steeping the seed before sowing in 1 per cent. mercurized aniline solution for 25 minutes, or in 1 per cent. mercuric chloride for 10 minutes. Inside the infected seeds, the bacterium was shown to be present just below the testa and occasionally inside the first superficial layer of the cotyledons.

Bormans (P.). **Les méthodes de sélection de la Betterave à sucre et la génétique.** [Methods of selection of Sugar Beet and genetics.]—*Bull. Ass. Chim. Sucr.*, liii, 5, pp. 417–438, 1 graph, 1936. [English and German summaries.]

In connexion with a discussion on hereditary factors in relation to sugar beet breeding, the writer briefly draws attention to the discouraging results hitherto obtained in all attempts to develop varieties truly resistant to *Cercospora beticola* [*R.A.M.*, xv, p. 550]. At the two breeding establishments under the author's supervision in France, all cases of apparent immunity were subsequently found to be due to anomalies or irregularities in the development of infection associated with slight fluctuations in the environmental conditions, to which the plant is highly sensitive.

Neuweiler (E.). **Die Bekämpfung der Herzkrankheit der Runkelrüben.** [The control of heart rot of Beets.]—*Landw. Jb. Schweiz*, l, 3, pp. 273–291, 2 figs., 1936. [French summary.]

During the period from 1932 to 1935 experiments were carried out at the Federal Agricultural Experiment Station, Oerlikon, Zürich, to determine the value of boron in the control of heart rot of beets [*R.A.M.*, xv, pp. 1, 626]. In six out of eight field tests the application of boric acid to the soil gave promising results, the improvement in the health of the plants being proportionate to the amounts given up to 12 kg. per hect., though even at this maximum rate the disease was not entirely eliminated. Contrary to the results of the preliminary

laboratory trials, borax (12 or 20 kg.) gave satisfactory control in the field, while a mixture of 4·4 kg. borax and 4 kg. copper sulphate was moderately effective. All the treatments resulted in increased yields and augmented the dry matter and sugar contents of the roots. The time of application (whether at planting or immediately on detection of the symptoms) appears to be of minor importance. The immersion of the seed-clusters for two hours in 0·25 per cent. abavit or germisan or in 0·25 or 0·5 per cent. boric acid improved the condition of the plants, presumably by stimulating them to overcome the ill effects of boron deficiency.

The efficacy of the boron treatment depends on the constitution of the soil, being less in the very severely affected bog and sandy loam types than in clay loam or sandy clay. The disease may be favoured by excessive applications of boron. In practice, boric acid (12 kg. per hect.) will be found preferable to borax on account of the ease with which it may be mixed with the fertilizer and strewn over the fields at planting time.

STAPP (C.) & HÄHNE (H.). **Zur Frage der Resistenz von Buschbohnensorten gegen den Erreger der Fettfleckenkrankheit Pseudomonas medicaginis var. phaseolicola Burkh.** [On the question of the resistance of dwarf Beans to the agent of the grease spot disease, *Pseudomonas medicaginis* var. *phaseolicola* Burkh.]—*Angew. Bot.*, xviii, 3, pp. 249–262, 1936.

Continuing the senior writer's studies on varietal reaction to grease spot (*Pseudomonas* [*Bacterium*] *medicaginis* var. *phaseolicola*) [*R.A.M.*, xiv, p. 415; cf. also xv, p. 191] in dwarf bean (*Phaseolus vulgaris*) samples of diverse origin, 360 lots of 56 varieties were tested in the greenhouse at the headquarters of the National Biological Institute, Dahlem, Berlin, and 476 specimens of the same number of varieties in the field at the Aschersleben [Saxony] branch.

The tabulated results of the trials show that of 320 samples of susceptible varieties at least 20 per cent. sprang from infected seed. A high degree of susceptibility as judged by both methods was manifested by Hinrichs Riesen speckled, St. Andreas, Peterseims Siedlerstolz, Riesen Flageolet 800, Riesen Schecken [Speckled], Ruhm von Thüringen, and the Wachs selections, Amtsrat Koch (stringless), Beste von Allen (Brittle), Erfurter Markt (stringless), Erntesegen, and Herbstsegen. A satisfactory degree of resistance for all practical purposes was shown by Doppelte Holländische Prinzess, Allerfrüheste Weisse, Erfurter Konservenwunder, Hundert für Eine, stringless Konserva, stringless Zucker Perl Perfection, Kaiser Wilhelm, Kaiser Wilhelm Riesen, Schlachtschwert (extra broad), and Nordstern.

A number of varieties showed greater susceptibility in the greenhouse than in the field, while with others the positions were reversed.

SCOTT WATSON (J. A.). **Notes on manuring.**—*J. Minist. Agric.*, xliii, 2, pp. 178–181, 1936.

In this paper the author states that potash deficiency, in certain cases at least, predisposes beans [*Vicia faba*] to attacks of chocolate spot (*Botrytis*) [*R.A.M.*, xiv, p. 734]. Very encouraging results, making

the difference between a very severe and a very mild attack, were obtained by applying a dressing of $1\frac{1}{2}$ cwt. per acre of muriate of potash or an equivalent potash salt.

Cowie (G. A.). **'Chocolate spot' in Beans.**—*Fertil. Feed. St. J.*, xxi, 5, p. 182, 1 fig., 1936.

The results of manurial trials in Buckinghamshire, Sussex, and elsewhere are stated to have shown that chocolate spot of broad beans [*Vicia faba*], believed to be mainly due in England to *Botrytis* [see preceding abstract], is largely controllable by the application to the soil of potash (in the form of kainit, 6 cwt. per acre, or of muriate of potash, $1\frac{1}{2}$ cwt., in the two instances for which particulars are cited). In the Sussex tests on Hastings Beds (potash-deficient) soil the plants in the untreated beds were devastated by the disease, while those receiving potash, though showing the chocolate spots, resisted the action of the fungus in a striking manner.

White (H. L.). **Diseases of early vegetables.**—*Rep. exp. Res. Sta. Cheshunt, 1935*, pp. 42–43, 1936.

Crown rot of rhubarb, associated with an organism apparently corresponding with *Bacillus rhaponticum* [*R.A.M.*, xiii, p. 288], was prevalent in 1934 and 1935 in a field near Cheshunt, where the diseased plants were observed to be distributed along the lines of planting. It was found that plants grown from sets replanted without storage were much less affected than those from sets stored for varying intervals; and furthermore the sets planted earliest and stored for the shortest period were those least affected.

Rodigin (M. N.). Об иммунитете Тыквы к антракнозу. [On the immunity of the Vegetable Marrow from anthracnose.]—*Тр. Быковской зон. опытн. Станции Бахчеводства.* [*Trans. Bykovskaya regional exp. Sta. Cult. of Cucurbits*], Stalingrad [Tsaritzin], *1935*, 3, pp. 59–76, 2 figs., 1935. [Received May, 1936.]

Anthracnose (*Colletotrichum lagenarium*) [*R.A.M.*, xiv, p. 344] of vegetable marrow (*Cucurbita pepo*) appears to be restricted to the Astrakhan district of U.S.S.R., though market produce originating from this district may, of course, be found infected elsewhere; a specimen collected at Kieff in 1907 is preserved in Leningrad. Several years' careful investigations of the fungus in the laboratory, confirmed by numerous inoculation experiments, showed that while the form on the melon, watermelon, and cucumber is morphologically indistinguishable from that found on the vegetable marrow, the former is incapable of attacking the vegetable marrow, while the latter is also pathogenic to the other cucurbits. Considerable differences were also observed in the behaviour of the two forms in pure culture on gelatine and agar media. The melon form (which is provisionally designated as strain α) grew abundantly on malt extract–peptone–gelatine, on which it formed orange-coloured acervuli, and later dark sclerotia. The vegetable marrow form (strain β) developed equally well on this medium, but did not produce acervuli; it developed instead typical fertile pycnidia. Strain α refused to grow on a malt extract–1 per cent. peptone agar

medium with 0·05 per cent. citric acid added; on this medium strain β grew well forming sclerotium-like fructifications of the acervulus type. In general, strain α was shown to require for its development complex albumins and certain sugars with a definite C/N ratio, while strain β was considerably less exacting in its nutritional relationships. Further tests showed that strain α produced appressoria freely in vegetable marrow juice and in unfavourable media, whereas strain β did not form appressoria in any of the media tested. It is believed, therefore, that the production of appressoria by strains of *C. lagenarium* in juice from cucurbitaceous hosts may indicate immunity in these hosts from the given strain.

A comparison of the two strains of *C. lagenarium* with a specimen of *Gloeosporium orbiculare* on vegetable marrow [ibid., xii, p. 418] received from W. G. Farlow and preserved in Leningrad showed that the latter species is entirely distinct.

Kalashnikoff (K. J.). **Trichothecium roseum Link** на Огуречных растениях в защищенном грунту. [*Trichothecium roseum* Link on Cucumber plants under glass.]—*Pl. Prot. Leningr., 1935*, 7, pp. 136–139, 1935. [English summary. Received May, 1936.]

Cucumbers grown under glass in the Leningrad area were severely attacked in the early spring of 1935 by a wet rot of the stem, leaf, and flower, which isolations and artificial inoculation experiments showed to be caused by *Trichothecium roseum*. Controlled investigations indicated that the attack was chiefly due to unfavourable environmental conditions (temperature falling below 17° C. during the night, poor lighting and ventilation, and excessive atmospheric humidity) in the glasshouses, under which the plants were considerably weakened and became etiolated. The first symptoms appeared on the cotyledons, whence they spread to the stems, leaves, and flowers. No secondary parasitic organisms were isolated from the diseased plants. The trouble should be easily preventable by maintaining conditions under glass favourable to the growth of the cucumbers, in conjunction with strict sanitary measures.

Klyushnikova (Mme E. S.), Vyatkina (Mme A. G.), Vassilieff (A. V.), & Zuckermann (R. V.). Общие условия культуры Шампиньона, грунты, расовый состав и прорастание спор. [General conditions for the cultivation of Mushrooms; substrata, varieties, and germination of spores.]—*Wiss. Ber. moskau. St. Univ., 1935*, 4, pp. 218–265, 6 figs., 1 diag., 7 graphs, 1935. [English summary. Received July, 1936.]

In tests made at Moscow of various substitutes for horse manure as a substratum for the cultivation of mushrooms (*Psalliota campestris*), the best yields were given by an admixture of 50 per cent. sawdust to the manure. Chemical analysis showed that the highest content in protein is found in mushrooms grown on a mixture of manure and tree leaves, and the lowest in mushrooms from manure plus sawdust. It was also determined that a series of changes occurs in the composition of the substratum according to the stage of development of the fungus, these changes agreeing with those established by Waksman, except that

cellulose and lignin accumulate in the manure instead of diminishing [*R.A.M.*, xii, p. 138].

The authors differentiate four varieties of the cultivated mushroom, namely, smooth white, white scale, brown, and the 'blond' variety (pink and yellow). Pure cultures of the four varieties have been obtained by germination of the spores after ten days at least on Lambert's agar, and by tissue transfers.

CHAZE (J.). **Compléments à l'étude des propriétés humorales du Champignon de couche envers la môle.** [Addenda to the study of the humoral properties of the edible Mushroom in relation to the 'môle'.]—*C.R. Acad. Sci., Paris*, ccii, 18, pp. 1529–1531, 1936.

The writer has experimentally demonstrated the presence in the cells of the carpophore, as well as in those of the hymenium of *Psalliota* [*campestris*], of thermolabile diffusible antitoxins inhibiting the development of *Mycogone* [*perniciosa*: *R.A.M.*, xv, p. 628].

KOVAČEVSKI (I. C.). Чернилката по Нахута **Mycosphaerella rabiei n.sp.** [The blight of Chick Pea, *Mycosphaerella rabiei* n.sp.]—Issued by Min. Agric. nat. Domains, Sofia, 80 pp., 4 pl., 1936. [English summary.]

A detailed and fully tabulated account is given of the author's laboratory and field studies of chick pea (*Cicer arietinum*) blight (*Ascochyta rabiei*) [*R.A.M.*, xv, p. 198], which is stated to be of considerable economic importance in southern Bulgaria, where it usually accounts for 20 to 50 per cent. of the crop, and occasionally involves the total failure of certain chick pea fields. In a detailed morphological description of the pycnidial stage (for which the generic name *Ascochyta* is preferred to *Phyllosticta*), the conidia are stated to be rarely (under 1 per cent.) septate, and to measure 6 to 16 by 3·4 to 5·6 μ on the host and 4·8 to 14 by 3·2 to 5·2 μ on artificial media. Perithecia of the fungus (the genetic connexion of which with the pycnidial stage was demonstrated both in pure culture and by inoculation experiments) were found exclusively on chick pea refuse, especially the pods, that had overwintered in the field. They are dark brown or black, globose or applanate, with a hardly perceptible beak and ostiole, 76 to 152 μ high, and 120 to 250 μ wide at their broadest portion. The asci are cylindrical-clavate, more or less curved, pedicellate, and 48 to 70 by 9 to 13·7 μ in diameter. The ascospores (eight to the ascus) are monostichous, rarely distichous, hyaline, ovoid, divided into two very unequal cells, strongly constricted at the septum, and measure 12·5 to 19 by 6·7 to 7·6 μ. The name *Mycosphaerella rabiei* is suggested for the perithecial form [but no Latin diagnosis is given].

Attempts to control the disease by hot water or chemical seed disinfection were unsuccessful, but three or four sprayings of the growing plants with 1 per cent. Bordeaux mixture or preferably with 1 in 40 lime-sulphur considerably reduced the severity of the disease; it is believed, however, that the most effective control is only obtainable by the use of healthy seed produced in isolated farms, protected from outside infection.

GOLDING (F. D.). **Cassava mosaic in Southern Nigeria.**—*Eleventh Bull. agric. Dep. Nigeria*, pp. 1–10, 1 fig., 1936.

Observations made in 1929 in Southern Nigeria showed that cassava plants with mosaic-diseased leaves on all branches yielded about 30 per cent. less than healthy plants [*R.A.M.*, xi, p. 152; xv, p. 342]; plants with diseased leaves on one branch yielded as much as healthy plants, indicating that the infection was of recent origin. The yield of two varieties introduced from Ibadan was respectively about twice and four times as much as from infected local cassava grown in contiguous plots, but 88 per cent. of the one and 42 to 59 per cent. of the other became affected within four months of planting. Roguing is impracticable over large areas in Southern Nigeria owing to dense vegetation. Spread is favoured by the native growers' use of cuttings from affected plants, and the author cites Joly's suggestion that seed should be used [ibid., x, p. 640].

Though transmission experiments with *Bemisia* sp. (the only insect abundantly present on cassava in south-western Nigeria) gave negative results, the author states in a footnote that he subsequently proved that the new species *B. nigeriensis* Corbett is a vector of cassava mosaic [ibid., xv, p. 72].

DU PLESSIS (S. J.). **Studies on the wastage of export Grapes with special reference to that caused by Botrytis cinerea, Pers.**—*Sci. Bull. Dep. Agric. S. Afr.* 151, 156 pp., 7 pl., 1 diag., 14 graphs, 1 map, 1936. [Afrikaans summary.]

In this full account of studies on the wastage of South African export grapes, with special reference to the form associated with infection by *Botrytis cinerea* (some of the results of which have already been noticed from another source [*R.A.M.*, xiv, p. 491]), the author gives descriptions of the various types of wastage and the fungi causing them, including besides the organisms previously identified, *Penicillium cyclopodium*, *P. expansum*, *P. elongatum*, *Aspergillus carbonarius*, *A. niger*, *Fusarium oxysporum* var. *aurantiacum* [ibid., xiv, pp. 72, 585; xv, p. 428], *Cladosporium baccae* [ibid., x, p. 408], and *Sphaeropsis malorum* Berk. [*Physalospora mutila*: see below, p. 726].

Comparative cultural studies with seven monospore isolations of *B. cinerea*—four from grapes and one each from apple, pear, and quince—revealed marked differences in sugar requirements, growth rate, colony characters, conidial and sclerotial production, conidial dimensions on potato dextrose, meat, and Conn's glucose asparaginate agar, and pathogenicity to Delicious and Rokewood apples and Barlinka grapes. On the basis of these disparities the strains under observation are regarded as entitled to varietal rank. *Botrytis* infection of grapes in the vineyard was found to be favoured by long periods of high humidity and the physiological condition of the grapes is thought to be one of the main factors affecting the occurrence of the disease both in the vineyard and in storage. The rotting caused by *Botrytis*, *Penicillium*, and *Cladosporium* increased directly with the mechanical injury to the grapes, which was found to be partly due to handling and transport subsequent to packing. Heavy or late application of

nitrogenous fertilizers, and to a certain extent potassic fertilizers increased susceptibility of Henab Turki grapes to wastage, but phosphatic fertilizers increased resistance. The amount of wastage was found to vary with the amount of nitrogen in the berry.

The relative efficiency of the various fungicides was compared on the basis of an index of control, calculated as $\frac{(a-p)+(b-q)+(c-r)+(d-s)}{a+b+c+d}$, where a, b, c, d are the average percentages of infection of bunches in the control boxes showing +, ++, +++, and ++++ amounts of mechanical damage, respectively, and p, q, r, s = average percentages of infection of treated bunches showing similar categories of mechanical damage. The classification of the data according to the varying amounts of damage in the bunches was considered essential for the proper interpretation of the results. On the basis of results obtained in 1933 to 1935 the author concludes that verderame sulphur was the best dust for the control of *Botrytis* rot in storage, whereas copper sulphur dust was most effective for the *Penicillium* storage rots but was not so good against *Botrytis* in storage, though satisfactory in the field. No control of the other types of wastage was obtained. Though the efficacy of the copper sulphur dust increased with the number of applications, not more than one or two would be worth while in moderately dry seasons. Iodized wrappers, prepared according to the formula of Tomkins [ibid., xiv, p. 321], reduced the amount of *Botrytis* rot considerably and are recommended as easily applicable and fairly effective. Fumigation with 4 per cent. formaldehyde for one hour or spraying the bunches, wrappers, or wood wool with a 4 per cent. solution also yielded promising results. Ripe and especially overripe grapes were much more susceptible to *Botrytis* and other storage rots than greener ones.

Shatsky (A. L.). Лечение Виноградной лозы от мильдью по инкубационным периодам. [Treatment of downy mildew of the Vine on the basis of incubation periods.]—*Pl. Prot. Leningr.*, *1935*, 6, pp. 75–85, 1 graph, 1935. [English summary. Received July, 1936.]

The author states that under the environmental conditions which generally obtain in the vine-growing areas of the U.S.S.R., the portion of Müller's curve of the incubation period of downy mildew (*Plasmopara viticola*) [*R.A.M.*, xv, p. 477] that needs to be taken into consideration in forecasting outbreaks of the disease may be represented by the formula $h(t-8) = 60$, in which h is the number of days of the incubation period, and t is the average mean daily temperature for that period. This formula is claimed to be sufficient for the theoretical computation of the length of the incubation periods at temperatures ranging from 10° to 24° C. Since, however, the length of the incubation periods varies more rapidly with slight fluctuations of the lower (near 10°) than of the higher (near 24°) temperatures, a greater precision is obtained by using for the first three or four incubation periods the corrected formula $h = \frac{60\,(t-8)}{(t-16)\,64\,D}$, in which h is the length in days

of the incubation period, t is the mean day temperature of the day on which infection occurred, and D is the increase in the mean daily temperature for a period of 30 days, both the two last-stated values being established on the base of meteorological records for a period of many years. Details are further given of the method by which the author proposes to compile 'incubation calendars' for the various vine-growing regions. Good control of the mildew should be obtainable by treating the vines one or two days before the end of the first, third, and fifth incubation periods, and so on until about the end of June.

WORMALD (H.). **Notes on plant diseases in 1935.**—*Rep. E. Malling Res. Sta., 1935*, pp. 142–145, 1936.

Of the plant diseases investigated at East Malling in 1935 [*R.A.M.*, xiv, p. 617] the following may be mentioned. *Pyrus purpureum* shrubs growing at Sedlescombe, Sussex, were affected by blossom wilt (*Sclerotinia laxa*), and the fruit of the same host in two other localities was attacked by *S. fructigena*. Medlars were severely infected by *S. mespili* [ibid., v, p. 109; vi, p. 619].

Top-grafted apple trees in various localities developed a cankered condition referred to as 'papery bark', associated in some cases with silvering of the foliage. *Stereum purpureum* was isolated from the discoloured wood and fructifications of this species developed on cankered branches when cut and exposed in the open, these facts suggesting that this fungus may be responsible for the disease.

Strawberries at Westerham showed symptoms resembling those of Lanarkshire disease [*Phytophthora* (?) *cinnamomi*, ibid., xv, p. 450]; the 'red core' condition was noted in the roots, and oospores were present.

Cherries were severely affected by bacterial canker, and Morello cherries [*Prunus cerasus*] developed a bacterial leaf spot associated with an organism which differed from *Pseudomonas prunicola* and *P. mors-prunorum* [ibid., xv, p. 139]. Other varieties of acid cherries were similarly affected, many flower clusters being killed on the Carnation variety.

From lesions on the shoots and leaves of *Forsythia* sp., an organism resembling *P. syringae* was isolated, inoculations with which into young lilac shoots gave definite lesions.

GALLOWAY (L. D.). **India: new plant diseases recorded in 1935.**—*Int. Bull. Pl. Prot.*, x, 6, pp. 121–122, 1936.

The following are among the items of interest in this list of new phytopathological records for India in 1935: *Helminthosporium sativum* [*R.A.M.*, xv, p. 86] causing black point of wheat, anthracnose of *Crotalaria juncea* (*Colletotrichum curvatum*) [ibid., ix, p. 187], *Urocystis sorosporioides* on *Delphinium* sp., *Ravenelia mitteri* on *Indigofera leptostachya* (the last-named reported by J. H. Mitter), and *Hendersonina sacchari* (?) [ibid., x, p. 223] on tea seedlings (reported by A. C. Tunstall).

WALLACE (G. B.). **Plant pathology.**—*Rep. Dep. Agric. Tanganyika, 1935*, pp. 104–113, 1936.

In this report [cf. *R.A.M.*, xiv, p. 678] it is stated that in preliminary trials on the control of coffee rust (*Hemileia vastatrix*) in the Northern

Province, where spraying as a rule is advisable, the value of spraying in maintaining healthy foliage was very marked. The best results were obtained with 0·8 or 1·0 per cent. Bordeaux mixture plus linseed oil, groundnut oil, or sulphite lye as a spreader. A few trees showed signs of resistance to the disease and are being propagated for testing.

A dry collar rot of coffee was reported from two plantations in the Usambara mountains on *Coffea arabica* only. Plants are affected when about 16 to 18 months old and turn yellow, become defoliated, die back, and may break at the collar and fall over. A characteristic swelling of the collar is observed at or below ground level. There are indications that the mealy-bug (*Pseudococcus brevispinosus*) may be implicated in the cause of the disease.

A strain of *Botrytis cinerea* was associated with warty disease of old 'cherries' in three localities, but its economic importance is as yet uncertain.

Black chaff of wheat (*Bacterium translucens* var. *undulosum*) [ibid., xv, p. 489], identified by J. McDonald, was recorded for the first time and *Puccinia anomala* occurred on barley in the Usambara mountains.

Both vine powdery mildew (*Uncinula necator*) and downy mildew (*Plasmopara viticola*) were present in Usambara and the latter in the Moshi district. Crown gall (*Bacterium tumefaciens*) was destructive to almond, plum, peach, pear, and apple and *Puccinia pruni-spinosae* [ibid., xv, p. 590] was found on plum. *Ascochyta phaseolorum* [ibid., xii, p. 330] is recorded on Lima bean (*Phaseolus lunatus*), a new host, and a mildew of lentils is referred provisionally to *Erysiphe polygoni*.

Hopkins (J. C. F.). **Annual report of the Senior Plant Pathologist for the year ending 31st December, 1936.**—*Rhod. agric. J.*, xxxiii, 6, pp. 413–421, 1936.

The following are among the items of interest in this report [cf. *R.A.M.*, xiv, p. 677]. The excessive rains of the early part of the 1934–5 season checked the growth of tobacco and frog eye (*Cercospora nicotianae*) [ibid., xv, p. 612] became well established on the lower leaves of all plants. Later, under dry conditions, most of the crop suffered from nitrogen deficiency and the remaining, chlorotic leaves soon became attacked. The slow development of the young plants resulted in heavy infection by mosaic, and pruning against frog eye before mosaic symptoms appeared spread the disease indiscriminately.

Severe infections by strawberry mildew [? *Sphaerotheca humuli*: ibid., xiv, p. 493], apple mildew [*Podosphaera leucotricha*: ibid., ix, p. 628], and tomato leaf spot (*Septoria lycopersici*) [ibid., xv, p. 690] occurred during the year.

The leaf curl disease found on wild species of *Sida* was successfully transmitted to cotton by budding and grafting.

G. M. Wickens reports that a tobacco leaf spot (associated with a *Phyllosticta* on the larger spots only) was rather common and is suspected to be due to a virus, non-transmissible by sap inoculations. A maize disease resembling streak [ibid., xiv, p. 626] occurred locally and appreciably reduced yields. A survey in the Umbali district showed that almost 100 per cent. infection may occur on one farm whilst another, only a few miles away, may be free from the disease. Heavy

mortality among locusts was due to infection by *Empusa grylli* [ibid., xv, p. 499].

New records made in 1935 include *Fusarium coeruleum* on potato, root rot of pansy (*Rhizoctonia* [*Corticium*] *solani*), *Puccinia pelargonii-zonalis* on geranium [*Pelargonium*: ibid., xv, p. 509], *Armillaria mellea* on apple, plum, and cherry, and *R. bataticola* (*Macrophomina phaseoli*) [ibid., xv, p. 632] on sweet potato.

STELL (F.). **Report of Mycologist, 1935.**—*Rep. Dep. Agric. Trin. Tob. 1935*, pp. 47–50, 1936.

This report [cf. *R.A.M.*, xv, p. 75] contains, *inter alia*, the following items of phytopathological interest. Cacao witches' broom (*Marasmius perniciosus*) has now been present in Trinidad for quite eight years, but there are still substantial areas free from the condition, and even larger districts in which the disease exists only in a mild, sporadic form. In some localities incidence is rather higher, and certain estates, occupying a large acreage, in low-lying areas where streams are present, are heavily infected. If cacao prices do not rise planters in these last zones should seriously consider replacing cacao by other crops. On the Government cacao estate at Marper diseased material was collected and destroyed every alternate month, instead of every month, as formerly; the new method was quite effective and is recommended for general adoption. The loss on the estate of mature pods owing to the disease was still under 2 per cent. The search for resistant trees and observations on non-infected trees previously noted have been continued but at the end of the year only 2 quarter trees and 14 full trees remained free from the disease.

The incidence of cacao black pod (*Phytophthora*) [*palmivora*: ibid., xv, pp. 561, 634] was normal in 1935 but the author considers that losses would be greatly reduced by attention to drainage in localities liable to floods.

The locally made oil used for destroying banana stools affected by Panama disease [*Fusarium oxysporum cubense*: ibid., xv, p. 664] has been found quite effective and satisfactory; only stools obviously diseased are treated. The Gros Michel banana is affected locally by leaf spots due to *Cercospora musae* [ibid., xv, p. 450] and *Cordana* sp. [*Scolecotrichum musae*: ibid., xv, p. 281]. The former is widely distributed and has been found also on the Giant Governor, Governor, and Sucrier varieties. The last-named variety, grown for ground shade in cacao fields, is severely attacked and probably constitutes the chief source of infection. The fungus does most damage to plants growing in exposed situations on poor soil, little damage being caused in fertile, well-watered, sheltered localities.

Tonka bean [*Dipteryx odorata*] thread blight [ibid., xiv, p. 256] was controlled by reducing excessive shade and destroying affected material.

Forty-eighth Annual Report Rhode Island State College Agricultural Experiment Station. Contribution 483.—40 pp., 1936.

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, xiv, p. 562]. The lawn grasses damaged in 1934 by

Rhizoctonia [*Corticium*] *solani* were again severely attacked in 1935, mainly between 9th and 25th July. Snow mould [*Calonectria graminicola*: ibid., xiv, p. 588] also developed in a virulent form in late March and April. Two new grass diseases were observed, namely, a distinct type of snow mould known as 'ring patch' and a peculiar 'dollar spot' associated with a sclerotial fungus, neither of which was controllable by mercurial treatments effective against the other troubles under investigation. The hosts of *Corticium fuciforme* [ibid., xiv, p. 587], the agent of 'pink patch', have been found to include hard fescue [*Festuca ovina* var. *duriuscula*], annual and Kentucky bluegrass [*Poa annua* and *P. pratensis*], quake grass [*Briza media*], redtop [*Agrostis alba*], the seaside and velvet bents [*A. palustris* and *A. canina*], and colonial bents. The minimum, optimum, and maximum temperatures for the development of the fungus are 1°, 20°, and 30° C., respectively. It was found to be capable of withstanding 18 months' exposure to a temperature of 25° and 10 days to one of 35°, while growth is resumed after 90 days at 0°. *C. fuciforme* grows best on beer wort agar at P_H 4·9 and on potato dextrose at 5·6, forming on the latter a pale pink mycelium, while on Williams's medium the coloration is deeper or more vivid.

Lime-sulphur (1 in 40 or 1 in 50) was found to cause a greater reduction of carbon assimilation in apple than flotation sulphur paste (1 in 55) or any of the other materials used for the control of scab (*Venturia inaequalis*) [ibid., xv, p. 484 and below, p. 726]. The disease was adequately combated by a schedule in which lime-sulphur (1 in 40) was followed by flotation sulphur after the calyx application.

Leaf spot and late blight of tomatoes [*Septoria lycopersici* and *Phytophthora infestans*] were controlled by four applications, at fortnightly intervals from 24th July, of coposil [ibid., xv, p. 666], red copper oxide [ibid., xv, p. 552], Burgundy mixture, ammonium copper carbonate, and Bordeaux mixture (1–1–50, 2–2–50, neutral, 4–4–50, 4–5–50, and 4–6–50). Of these treatments, only coposil and the first two Bordeaux combinations improved the quality of the staked fruit, while Burgundy (5–5–50) caused visible burning injury. The best yield of the staked plants was given by plots treated with 4–4–50 Bordeaux, and of the unstaked by plots treated with red copper oxide and ammonium copper carbonate.

Chargraff (E.) & Levine (M.). **Chemical composition of Bacterium tumefaciens.**—*Proc. Soc. exp. Biol.*, xxxiv, 5, pp. 675–677, 1936.

From a virulent strain of *Bacterium tumefaciens* [*R.A.M.*, xv, p. 560] cultured on sterile bean broth in the dark at room temperature for 14 days, washed, and suspended in a mixture of equal amounts of alcohol and ether, the writers isolated a yellow, viscous, oily, acetone-soluble fat, apparently containing unsaturated fatty acids of high molecular weight, and a phosphatide consisting of a sticky, yellow powder with a melting-point at 125° [C.]. From the defatted bacteria a polysaccharide was obtained containing some 65·3 per cent. of reducing sugars (calculated as glucose). Preliminary tests on Paris daisy [*Chrysanthemum frutescens*], geranium [*Pelargonium*], and *Ricinus* [*communis*] indicate that the phosphatide exerts a growth-stimulating action, in which respect the fat is much less active.

SĂVULESCU (T.). **L'immunité aux maladies bactériennes des plantes.** [Immunity from bacterial diseases of plants.]—*Arch. roum. Path. exp. Microbiol.*, ix, 2, pp. 209–281, 1936.

The most important conclusions arising out of this comprehensive survey (followed by a bibliography of 318 titles) of the literature on immunity from bacterial diseases in plants have already been summarized from another source [*R.A.M.*, xv, p. 677].

PELTIER (G. L.), YOUNT (M.), & SUNESON (C. A.). **The stem rust epidemic of 1935 in Nebraska.**—*Plant Dis. Reptr, Suppl.* 91, 18 pp., 1 pl., 23 maps, 1936. [Mimeographed.]

A detailed account is given of the severe epidemic of wheat stem [black] rust (*Puccinia graminis tritici*) [*R.A.M.*, xv, p. 631] which developed in Nebraska in 1935. The yield of spring wheat averaged only 9 bush. per acre for the entire State, and 60 per cent. of the loss of yield is attributed to stem rust; the corresponding figures for winter wheat were 13 bush. and 50 per cent. The sequence of factors necessary for an epidemic of stem rust are stated to be delayed seeding (spring wheat) or delayed early spring development (winter wheat), late heading and ripening, and a long fruiting period with weather favouring extensive infection occurring about the earing time of the winter grains. These conditions synchronize only in occasional years, and the possibility of stem rust epidemics occurring in the future should not be allowed to interfere with the continued eradication of barberry in the Great Plains area west of the Mississippi. By breeding rust-resistant wheats for those areas in Texas where the uredospores normally overwinter infection from this source will also be reduced. Only when both sources of rust are effectively controlled can occasional epidemics be expected to cease.

ROBERTS (FLORENCE M.). **The determination of physiologic forms of Puccinia triticina Erikss. in England and Wales.**—*Ann. appl. Biol.*, xxiii, 2, pp. 271–301, 1936.

A tabulated account is given of studies from 1932 to 1934, inclusive, at Cambridge of the reactions of 46 collections of *Puccinia triticina* [*R.A.M.*, xv, p. 492] (all of which, except three from Portugal, were made in England and Wales) on the differential wheat varieties Webster, Hussar, Democrat, Mediterranean, Malakoff, Loros, Carina, and Brevit. Ten new forms (66 to 75, inclusive) were isolated, the first eight of which were determined in material from Great Britain and the last two in that from Portugal. From British material form 66 was isolated fourteen times, form 15 seven times, form 67 five times, form 70 twice, and forms 69, 71, 72, and 73, together with form 10, once only each. Form 10 was found in the greenhouse as a variant of form 66, this being stated to be the first recorded instance of mutation in pathogenicity in *P. triticina*. It is suggested that mutation may account for the occurrence in Great Britain of the hitherto undescribed physiological forms of the rust, in spite of the apparent absence there of susceptible species of *Thalictrum*. Form 66 differed from any of the other forms encountered in the apparent inherent instability of the reaction produced on Hussar wheat, which abruptly changed from a resistant to a susceptible type,

a change which could not be satisfactorily correlated with environmental conditions or with a mixture of cultures.

The reactions of some of the differential hosts to certain physiological forms were affected by changes in environmental conditions [ibid., xv, p. 562]. Thus, for instance, excessively high temperatures during incubation, on the one hand, and decreased light intensity combined with lower temperatures, on the other hand, were responsible for the abnormal production of a type '*x*' reaction on certain of the differential varieties. Low light intensity and low temperatures appeared to be associated with an increase in resistance in the normally susceptible reactions of many varieties, the first factor being apparently the more important of the two, while increased temperature and light intensity tended to modify the normally resistant reactions of some other varieties towards susceptibility; resistance appeared, however, to be less sensitive to fluctuations in environmental conditions than susceptibility. The normal resistance of certain wheat varieties, e.g., Malakoff, Webster, and Democrat, to some of the forms was reduced by infection with mildew (*Erysiphe graminis*) [ibid., xiv, p. 88].

STEFANOVSKI (I. A.). **Influence of environmental factors on immunity of Wheat.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., ii, 8, pp. 341–345, 1936.

A summarized account is given of field experiments at the Krasnokutsk (Lower Volga basin) Plant Breeding Station, in which the effect was tested of the date of sowing and of cultural practices on the intensity of attack by brown rust (*Puccinia triticina*) [*R.A.M.*, xv, pp. 562, 571] on a world collection of 135 wheat samples. The results showed that the incidence of the rust sharply increased with the retardation of the date of sowing from 9 per cent. showing the maximum degree of infection (Vaviloff's scale) among the early-sown, to 42 per cent. among the medium sown, and 48 per cent. among the late-sown. Under irrigated conditions the incidence of rust markedly increased (e.g., the percentage of samples showing the maximum degree of infection was 9 under arid conditions and 72 under irrigation), but the majority of varieties resistant when late sown retained their immunity even though irrigated. Under irrigation the varieties of durum wheats originating in the Mediterranean belt and neighbouring countries, such as Tunisia, Algeria, Palestine, Syria, Trans-Jordan, and Portugal, were the most resistant to the rust. Yarovization [vernalization: cf. ibid., xv, p. 489] appeared to reduce the incidence of the rust in certain early-sown varieties, but increased it in some others. In late sown wheats the rust incidence was for the most part increased by vernalization, owing to a lack of uniformity in the development of the treated plants.

CALDWELL (R. M.) & STONE (G. M.). **Relation of stomatal function of Wheat to invasion and infection by leaf rust (Puccinia triticina).**—*J. agric. Res.*, lii, 12, pp. 917–932, 3 pl., 1 fig., 1936.

This is a full report of the authors' study of the relation existing between the function of the host stomata and the invasion and infection of wheat seedlings by leaf [brown] rust (*Puccinia triticina*), an abstract from which has already been noticed from another source [*R.A.M.*, xi, p. 440].

KALÉ (F.). **Résistance relative des Blés au Puccinia glumarum Eriks. et Henn. dans la région versaillaise.** [Relative resistance of Wheats to *Puccinia glumarum* Eriks. & Henn. in the region of Versailles.] —*Ann. Épiphyt.*, N.S., ii, 1, pp. 14–19, 1 fig., 1936.

In this paper the author describes a technique devised by him for studying the hydrogen-ion concentration of the cell contents of certain wheat varieties susceptible or resistant to *Puccinia glumarum.* The method used consists in mounting thick transverse sections of the leaf in water and observing the reaction obtained in the living cell after the introduction by means of a micro-pipette (0·5 to 1·5 μ in diameter at the end) of an indicator, phenol red in distilled water giving the best results. The experiments were carried out on various dates between February and June, inclusive, over a two-year period, and taking the results as a whole, the Noah variety (highly susceptible) gave a lemon to pale yellow reaction, while Sirodot (susceptible), Mentana (highly susceptible), Vilmorin 23 (less so), Hope (less so), Piave (usually less so), Warren (not very susceptible), and Hindi 8 B (not very susceptible) gave, respectively, the following reactions, viz.: yellow, yellow to pale yellow, pale orange to rose-orange, pale rose to rose, pale orange to red, dark orange red to red, and red. Phenol red gives a yellow colour for acidity and red for alkalinity (P_H 6·8 and 7, respectively).

FOËX (E.). **Étude expérimentale des piétins du Blé au cours de la campagne 1934–1935.** [An experimental study of Wheat foot rots during the season 1934–1935.]—*Ann. Épiphyt.*, N.S., ii, 1, pp. 1–11, 2 figs., 1936.

The results of experimental infection of wheat with *Cercosporella herpotrichoides* [*R.A.M.*, xiv, p. 502; xv, p. 566] and *Ophiobolus graminis* [ibid., xv, p. 639] showed that active development of the former took place from October to April (inoculations on the 15th January 1935 giving 100 per cent. infection, those in mid-February, March, and April only slight infections, and that on 15th May having no effect on yield), whereas that of the latter was from early spring until harvest-time. Both affected 100 per cent. of the stools and tillers. The former reduced the total weight by 47 per cent., and the latter by 37 per cent., but the whiteheads caused by *O. graminis* reduced the weight of the ears and grain to a greater extent than *C. herpotrichoides*.

Wheat seed was treated with formalin, neutral Bordeaux mixture plus casein, cupric chloride, or neutral ortho-oxyquinoline sulphate, and then inoculated with *C. herpotrichoides* or *O. graminis*, but none of the treatments gave adequate control of foot rot. Neither fungus appears to be seed-borne, and where a slightly beneficial effect did accrue from any treatment it was due, apparently, more to a protection afforded to the seedlings against attacks from parasites in the soil than to seed disinfection. Spraying against *C. herpotrichoides* with sulphuric acid (12 l. at 65° Baumé per 100 l. water) on 1st January, 1st February, 1st March, 1st April, and 1st May in all cases reduced the yield of the uninoculated controls and gave a beneficial effect on the infected plants only when applied in May, when infection was very slight.

[A condensed version of this paper appears in *C.R. Acad. Agric. Fr.*, xxii, 4, pp. 140–147, 1936.]

GREČUŠNIKOV [GRETSCHUSHNIKOFF] (A. I.). **The physiology of the incubation period in rust infections.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., ii, 6, pp. 245–247, 1936.

The results of the experiments briefly discussed in this paper showed that in oat leaves heavily infected with *Puccinia coronifera* [*P. lolii*] photosynthesis is increased during the first few days of the incubation period, but soon falls and remains low even after the formation of the pustules [*R.A.M.*, xiv, pp. 300, 625]. Respiration, on the other hand, is at first sharply depressed, but abruptly increases with the onset of the spore formation by the rust, this increase coinciding with the appearance of urea in the host tissues [see next abstract]. In contrast with the result obtained by Schmidt [ibid., xii, p. 317] for *Uromyces betae* and *P. glumarum* no fat formation was detected after infection in the assimilatory cells of oats.

GREČUŠNIKOV [GRETSCHUSHNIKOFF] (A. I.). **Toxins of rust (Puccinia).** —*C.R. Acad. Sci. U.R.S.S.*, N.S., ii, 8, pp. 335–340, 1936.

Following a brief reference to a previous paper by A. A. Richter in collaboration with the author (*J. exper. Agron. S.-East* [Russian], vii, 1929) describing the isolation of toxins elaborated by rusts (*Puccinia* spp.), an account is given of a chemical investigation of the toxins of sunflower rust (*P. helianthi*), oat crown rust (*P. coronifera*) [*P. lolii*], and sow thistle [? *Cnicus arvensis*] rust (*P. suaveolens*) [*P. obtegens*: *R.A.M.*, viii, p. 791; xiv, p. 52]. The accumulation was demonstrated in aqueous toxin extracts (obtained from rusted leaf blades subjected to a preliminary desiccation at 80°) of ammonia and urea [see preceding abstract], confirming the view expressed by Chrzaszcz and Zakomorny (*Biochem. Z.*, cclxxv, 1–2, 1934) concerning the widespread capacity of fungi to form urea. Since no correlation was found between the severity of infection of the host and the amount of ammonia and urea in the extracts the author believes that a part of these compounds is eliminated by the metabolism of the host, and support for this hypothesis was found in the fact that saprophytic growth of the rust fungi was obtained during 12 days by removing the ammonia from the substratum by the addition of substances that adsorbed it. From the preponderance of ammonia and urea in the toxin extracts he concludes further that they are the active toxic principles. This view was supported by the results of experiments, in which various dilutions of 'natural' toxins and aqueous solutions of urea and ammonium salts were individually introduced by infiltration into healthy host leaves (by centrifuging the leaves for 6 minutes at 2,000 revolutions per minute). It was shown that ammonium salts introduced directly into the leaves depress photosynthesis, while urea intensifies it; at high concentrations the toxins, like ammonia, depressed photosynthesis, but at low concentrations they markedly intensified it; extracts from healthy leaves also intensified photosynthesis at all concentrations. Respiration was greatly intensified both by slightly diluted toxin extracts and by ammonia and urea. Finally, it was shown that the permeability of the host tissues is comparably increased by the rust toxins and by ammonia and urea.

WESTERN (J. H.). **The biology of Oat smuts. IV. The invasion of some susceptible and resistant Oat varieties, including Markton, by selected biological species of smut (Ustilago avenae (Pers.) Jens.) and Ustilago kolleri (Wille).**—*Ann. appl. Biol.*, xxiii, 2, pp. 245–263, 2 pl., 6 figs., 1936.

In continuation of this series of investigations on the biology of oat smut fungi [*R.A.M.*, xii, p. 758] the author gives a detailed account of histological studies of the invasion of oat seedlings inoculated with various forms of *Ustilago avenae* and *U. kolleri*, as a result of which he classifies the oat varieties in five grades according to the degree of resistance shown by them. In the first grade, comprising the most highly resistant forms (as exemplified by Markton to the L_{11} strain of *U. avenae* and C_1 strain of *U. kolleri*), all attempts at penetration by the smuts are frustrated by the development in the cell wall of a pad of material related to cellulose. In the second grade (Markton to *U. avenae* L_1 and L_2, and *U. kolleri* C_4), penetration is achieved, but the mycelium is confined to the superficial tissues only, and in seedlings 7 days old it is accompanied by marked necrosis in the surrounding host tissues, after which the mycelium rapidly degenerates and dies out. In grade three (Markton to *U. kolleri* C_2 and Potato oat (*Avena sativa*) to *U. avenae* L_{11}), intracellular mycelium is present in 7-day-old seedlings in the coleoptile and mesocotyl; most of it degenerates, but isolated traces of it may still be found in 21-day-old plants. In grade four (a selection of Welsh Strigosa to *U. avenae* L_1 and *U. kolleri* C_4), intracellular mycelium is abundant at seven days in the coleoptile and mesocotyl; at 14 days it is both intra- and intercellular and penetrates the deeper host tissues; at 21 days, remains of the mycelium are still present in the mesocotyl, but the growing point and meristems are not infected. In the fifth grade, the mycelium is very abundant at 21 days in the mesocotyl, and the growing point and meristems are heavily invaded. In oats, therefore, resistance to smut may be expressed as a reaction of the epidermal cell wall, a necrosis of the host cells, and a retarding effect on the growth of mycelium within the host.

Sheathing structures around the penetrating hyphae [loc. cit., p. 756] were found in Markton oat inoculated with *U. kolleri* forms C_1 and C_4; microchemical tests showed that they dissolved slowly in zinc chloride solution.

TAPKE (V. F.). **The influence of seed hulling on loose smut in naturally inoculated Oats.**—*Phytopathology*, xxvi, 6, pp. 588–596, 1936.

Hulling was shown by field observations in Virginia and Idaho not to afford a reliable basis for the determination of the relative importance of inoculum in the hulls and pericarp in the development of loose smut of oats (*Ustilago avenae*) [*R.A.M.*, vi, p. 411]. Within individual lots the percentages of reduction in smut in plants raised from hulled seed ranged from 2·1 to 90·2 per cent. in the three experimental localities, while in different lots grown under similar conditions wide variations in smut reduction from hulling also occurred. In general, relatively unfavourable conditions for the disease were more acutely reflected in plants from hulled seed than in those from non-hulled. The inconsistencies

in the amount of smut reduction from hulling indicate that this process involves other factors besides a decrease in the load of inoculum carried by the hulls. These organs may apparently serve as more or less effective buffers in protecting the inoculum in the pericarp from various soil influences inimical to infection. Hulled seed of all the ten lots used in the tests produced some diseased plants, showing that at least a portion of the loose smut resided in the caryopses.

Austin (W. W.) & Robertson (D. W.). **Inheritance of resistance to Ustilago levis (K. & S.) Magn. (covered smut) in a cross between Markton and Colorado 37 Oats.**—*J. Amer. Soc. Agron.*, xxviii, 6, pp. 467–471, 1936.

Seed from the F_1 progeny of hybrids between Markton (C.I. No. 2053) oats, resistant to covered smut (*Ustilago levis*) [*U. kolleri*: *R.A.M.*, xv, p. 493], and Colorado 37 (C.I. No. 1640), susceptible to the disease, was threshed, dehulled, and inoculated with ground smutted panicles. In the F_2 the discrepancies were too great to permit of definite conclusions as to reaction to *U. kolleri*. The F_3 families segregated in the ratio of 9 healthy to 7 diseased, whence it was inferred that a two-factor difference for smut exists between the parents, Markton possessing the two dominant factors for resistance, while Colorado 37 had the recessive allelomorphs of these factors. Certain very promising, highly resistant lines are being continued in the hope of securing some prolific, smut-resistant commercial strains.

Davis (G. N.). **Some of the factors influencing the infection and pathogenicity of Ustilago zeae (Beckm.) Unger on Zea mays L.**—*Res. Bull. Ia agric. Exp. Sta.* 199, pp. 248–278, 8 figs., 4 graphs, 1936.

In this amplified account of his studies on maize smut (*Ustilago zeae*) [*R.A.M.*, xiv, p. 750; xv, p. 572; and next abstract] the author states that a survey conducted in several fields near Ames, Iowa, at the end of the seasons of 1930 to 1934 inclusive, showed 10·6, 8·9, 13·9, 5·5, and 18·3 per cent. of the plants affected by visible smut galls. When the leaf sheaths were stripped from 1,985 plants exposed to natural and artificial infection in 1934 many small smut galls, aggregating 39·3 per cent. of the total infection, were found at the nodes, showing that smut readings based on exposed galls alone are much too low. The exposed symptoms comprise irregular, yellow or reddish stripes or blotches, brownish lesions, and galls, and the concealed symptoms small, nodal galls and minute pustules of chlamydospores in leaves of axillary buds.

Stimulation of axillary bud development by inhibiting pollination by bagging the shoots just before silking resulted in increased percentages of smutted plants, from 11·6 to 32·4 and 11·8 to 21·8 in artificially inoculated plants in 1932 and 1933, respectively, and from 8·3 to 28·3 and 6·2 to 13·9 in naturally infected plants in the same years. The percentage of nodal smut infection increased with lateness in planting, data for two years showing an average of 12 per cent. on May 15th plantings and 40 per cent. on the June 4th plantings. Rate of planting was found to affect smut infection, as indicated by nodal galls, the percentage increasing both ways from the 2–3 rates of planting, plants growing 1, 3, and 5 per hill showing 40·8, 22·5, and 32·4 per cent. infec-

tion, respectively, in 1931; 20·4, 13·5, and 21·6 in 1932; 9·0, 4·3, 5·9 in 1933, and 22·8, 14·6, and 18·5 in 1934.

WALTER (J. M.). **Factors affecting the development of Corn smut, Ustilago zeae (Beckm.) Unger.**—*Tech. Bull. Minn. agric. Exp. Sta.* 111, 67 pp., 3 figs., 1 diag., 1936.

In studies carried out at the University Farm, St. Paul, Minnesota in 1930–33 on maize smut (*Ustilago zeae*) [see preceding abstract] it was found that mutilation by slashing and by detasseling (topping) markedly increased the severity of smut only when practised on plants at an intermediate stage of growth, the response evidently depending upon host genotype.

No increase in infection resulted from the application of large amounts of inoculum to parts of the plant reached by meteoric water, whence it is concluded that there is usually an abundance of inoculum and that its effectiveness is influenced to a considerable extent by environmental factors. Injection of sterilized water into the spirals of 12 to 20 inch plants greatly increased total smut infection (but not nodal-bud smut on the Rustler variety), especially in the latter half of the season, apparently by making contact between inoculated meteoric water of the upper leaf spiral and the young susceptible tissues lower down. Rolling the leaf spirals between the hands during or following rain in imitation of the spiral loosening effect of twisting in the wind effectually increased smut on plants between the 12 in. and early boot stages.

Direct infection through the young husks caused ear smut in some lines but does not appear to be very common. Smut was generally more destructive to late than to early plantings. On low, well-watered land the Rustler variety developed less smut than that on land deficient in moisture but Northwestern Dent did not respond in the same manner. The application of fertilizers did not significantly affect smut attack during the four seasons of the experiments. Cultivation practices affected the vigour of the plants in 1931 but not the total smut incidence; usually the prevalence of nodal-bud smut was inversely related to vigour in both Rustler and Northwestern Dent varieties. Sustained rapid development of maize plants to full stalk size frequently favours escape from, or resistance to, smut and development of large smut galls later in the season appears to be dependent upon lateral meristem activity.

BURK (E. F.), CROSS (C. B.), & HIXSON (E.). **Variety tests of Sweet Corn and its resistance to Corn earworm and smut injury.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 502–504, 1936.

In a test at the Oklahoma Agricultural Experiment Station on the reaction to maize smut (*Ustilago zeae*) [see preceding abstracts] of 39 commercial varieties and strains of sweet corn, the following six proved to be the most resistant: Golden Giant (1·6 per cent. infection), Ideal or Big Adams (1·9), Norfolk Market (2·1), Top-Cross Bantam (2·7), Trucker's Favourite (2·9), and Country Gentleman (3·0). The disease was most prevalent in the stands raised from southern-grown seed and there was a tendency for heavy smut infection to be associated with poor stands, which may indicate that smut infection destroys many young plants.

Fernando (M.). **Mottle leaf of Citrus: its incidence and control.**—*Trop. Agriculturist*, lxxxvi, 6, pp. 332–334, 1 col. pl., 1936.

Mottle leaf is stated to occur on a variety of soil types in Ceylon affecting chiefly mandarin oranges [*Citrus nobilis*], though it has also been observed on sweet orange, grapefruit, and West Indian lime [*R.A.M.*, xv, p. 576]. Satisfactory control was obtained by spraying with zinc sulphate and lime (10–5–100) plus ½ lb. solol or 4 oz. actin as a spreader.

Pittman (H. A.) & Owen (R. C.). **Anthracnose and mottle leaf of Citrus in Western Australia.**—*J. Dep. Agric. W. Aust.*, xiii, 2, pp. 137–142, 2 figs., 1936.

Citrus anthracnose (*Colletotrichum gloeosporioides*) [*R.A.M.*, xv, p. 496] has gradually increased in importance in Western Australia during recent years, and observations suggest that this may be correlated with the increasing development of mottle leaf [see preceding and next abstracts]. Experiments are described in which the attempt was made to overcome the mottle leaf condition associated with die-back by spraying with zinc sulphate. Six badly mottled Valencia and navel orange trees sprayed on 27th October, 1935, with a 1 per cent. solution showed a definite improvement over the unsprayed controls after six weeks. At the same time, another tree was sprayed with the same solution on one side only. Six weeks later the new growth on this side was free from mottling, whereas the unsprayed part was markedly chlorotic, though the beneficial effect had spread to it. In further experiments, trees sprayed once with 1 per cent. solution showed marked improvement, others sprayed twice showed no improvement over those sprayed once, and may have been slightly checked, while yet others, sprayed with ½ per cent. solution, benefited considerably. Pending further experiments, no definite recommendations are made for the spraying of commercial orchards, but for experimental purposes the author suggests that growers should use either zinc lime mixture (5–2½–50) or zinc Bordeaux (2½–2½–5–50).

Parker (E. R.). **Experiments on the treatment of mottle-leaf of Citrus trees. II.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 82–86, 1936.

In further experiments on the control of mottle leaf of citrus in California by zinc compounds [*R.A.M.*, xiv, p. 506; and preceding abstracts], good results were again obtained on Valencia oranges by spraying with zinc sulphate and lime, applied at a strength of 10–5–100 to severely diseased and at that of 5–2½–100 to mildly affected trees. Complete coverage of the trees is not essential and, in general, the curative effects of sprays of 4·2 or 10 galls. per tree are thorough and durable. Improved adhesion was secured by the addition to the mixture of powdered blood albumin (4 oz. per 100 galls.). Promising results have also been given by zinc oxide (3 or 1½ lb. per 100 galls. according to the severity of the symptoms) and (in preliminary tests) by a number of other zinc compounds, but a longer period is necessary before a final judgment can be formed on the efficacy of the latter.

BATES (G. R.). **I. Studies on the infection of Citrus fruits. i. Some methods of infection by the green mould—Penicillium digitatum Sacc.**—*Publ. Brit. S. Afr. Co., Mazoe Citrus exp. Sta.* 4b, pp. 88–101, 1936.

In continuation of his studies on the infection of citrus fruits by *Penicillium digitatum* [*R.A.M.*, xiii, p. 228; xv, p. 495] the author has found that dry spore inoculations through needle punctures are not successful unless the wounds reach the inner pulp or one or more oil vesicles are ruptured, the flavedo and albedo being entirely resistant to infection under these conditions. Inoculations with aqueous spore suspensions through wounds between the oil vesicles gave positive results, the percentage of infection increasing with the depth of the wounds, being low in very shallow wounds and very high in those extending to the albedo. Resistance to infection through shallow wounds was completely broken down by using as inoculum a spore suspension either in orange juice or in the essential oil of the rind, while 4 per cent. fructose promoted infection better than 5 per cent. sucrose or distilled water alone. Scale-infested oranges were easily infected when inoculated with spores suspended in orange juice. Sound oranges were also infected through the rind by using a similar inoculum, success depending apparently on the quantity of inoculum available. Preliminary inoculation experiments with aqueous suspensions of spores indicated that infection of oranges may take place through the stem end in the absence of wounding, but the point of entry was not determined.

BATES (G. R.). **Storage tests with Rhodesian Oranges during 1934.**—*Publ. Brit. S. Afr. Co., Mazoe Citrus exp. Sta.* 4 b, pp. 103–131, 5 pl., 1936.

In the preliminary tests reported in this paper Jaffa, Mediterranean Sweet, and Valencia Late oranges were stored at 36° and 40° F.

A physiological breakdown or pitting [*R.A.M.*, xv, p. 647] was observed on the Jaffa and Valencia Late varieties, and to which Washington Navels were also found susceptible. The earliest symptom is usually a small brown discoloration of the tissues surrounding the oil vesicles, a number of small spots being scattered over the fruit or localized in one area. The markings increase in size and coalesce to form large, irregular lesions, which darken to various shades of brown. As the surrounding tissues dry out the oil vesicles collapse and appear as minute cavities. With long storage the lesions extend to the spongy albedo.

Pitting was more severe at 36° than at 40° and more prevalent among late-season than early-season fruit. Most of the pitting developed during the first three or four weeks of storage. Ethylene-treated fruit stored soon after colouring showed much more pitting than wilted fruit but this was remedied by giving the former an extra seven days' wilt before storage. A considerable degree of control was also obtained by wrapping the fruit in paper containing 8 per cent. mineral oil. The disorder is thought to be closely associated with respiratory activity.

Wastage was approximately the same at the two storage tempera-

tures used. Losses from moulds during the first four weeks was negligible and due solely to *Penicillium italicum* and *P. digitatum*. Stem-end and core rots did not develop appreciably till after 8 weeks, when isolations showed that *Colletotrichum gloeosporioides* [see above, p. 714] generally attacks the skin tissues and *Alternaria citri* the core and pulp. Wilted oranges showed less wastage than the ethylene treated, and generally speaking the longer the fruit was held in cold storage the more rapidly it deteriorated on removal. The ineffectiveness of surface sterilization in the control of *C. gloeosporioides* is thought possibly to be due to dormant infection which takes place when the fruit is immature. In experiments with Valencia oranges, two distinct types of stem-end browning were observed, termed depressed and smooth (or superficial browning), respectively. *A. citri* was commonly isolated from oranges with the former symptoms and in most cases the decay found was central rot. In smooth stem-end browning the injury is superficial and *C. gloeosporioides* was almost invariably isolated from the underlying skin tissues. In two tests wilted fruit showed 26 and 25 per cent. stem-end browning against 32 and 33 per cent. for the ethylene coloured.

Carrera (C.). **Informe de las observaciones y experimentaciones efectuadas sobre una nueva enfermedad aparecida en los Citrus de Bella Vista (Corrientes).** [Report on the observations and experiments carried out on a new Citrus disease that has developed at Bella Vista (Corrientes).]—*Bol. Minist. Agric., B. Aires*, xxxvii, 1–4, pp. 15–36, 2 col. pl., 5 figs., 1935. [Received September, 1936.]

A fully tabulated account is given of the writer's studies on a new disease causing heavy damage in the citrus (mostly orange grafted on *Citrus aurantium*) groves of Bella Vista (Corrientes, Argentine). The trouble is characterized by yellowing of the leaves, premature defoliation and shedding of the flowers and fruit, and discoloration of the rootlets, the brittle cortex of which is readily detachable, revealing a reddish or bluish central cylinder. The disturbance appears sporadically, sometimes simultaneously, in different parts of a grove, mostly on 12- to 15-year-old trees in low-lying, poorly fertilized sites, on impermeable sandy soil with an acid reaction.

Negative results were given by inoculation experiments on *C. aurantium* with the three species of *Fusarium* isolated from the diseased material, namely, *F. oxysporum* var. *aurantiacum* [*R.A.M.*, xv, p. 701], *F. solani* var. *martii* [ibid., xv, p. 643], and *F. solani* [ibid., xiii, p. 631], and their part in the etiology of the disease is considered to be purely secondary, the primary factors being nutritional and physiological. Control measures should include the use of green, and stable manure, the application to the soil of calcium carbonate and appropriate synthetic fertilizers, and treatment of the trees with 1 per cent. Bordeaux mixture or other standard fungicide.

Baker (R. E. D.). **Root disease of the Lime in Montserrat.**—*Trop. Agriculture, Trin.*, xiii, 6, pp. 147–148, 1936.

From dead branches and roots of lime trees affected with root disease, associated with attacks of *Diaprepes* larvae in Montserrat, the author isolated *Botryodiplodia theobromae*, *Phomopsis* [*Diaporthe*] *citri*,

and a *Fusarium* sp., the last-named fairly constantly, but these are not considered to be primary parasites. *Diplodia* die-back may be distinguished from root disease, which exhibits die-back symptoms, by the facts that in the former the branches are generally black, the disease starts from the top or windward side of the tree and is limited to the upper parts. *Diplodia* is a common saprophyte and may occur on dead parts of a tree attacked by *Diaprepes* while possibly *Fusarium* sp. and *Sphaerostilbe repens* [*R.A.M.*, xv, p. 574] may be weakly parasitic following damage to the roots by the larvae. Red root disease (*S. repens*) and withertip (*Gloeosporium limetticolum*) have so far caused no serious losses in the Island probably owing to the dry climate.

TURNER (F. A. S.). **Shell bark (decorticosis) of Lemon trees.**—*Fmg S. Afr.*, xi, 123, p. 258, 1 fig., 1936.

A popular note is given on shell bark or decorticosis of lemons (*Phomopsis* [*Diaporthe*] *citri*) [*R.A.M.*, xv, p. 496], which is stated to occur occasionally in South Africa on the Eureka and Villa Franca varieties, mature plants only being affected.

HENDRICKX (F. L.). **Liste annotée des organismes végétaux signalés sur le genre Coffea. En annexe : maladies physiologiques ou d'origine mal connue.** [An annotated list of plant organisms recorded on the genus *Coffea*. Appendix: diseases of physiological or imperfectly known origin.]—*Ann. Gembl.*, *1935*, pp. 407–465, [1935]; *1936*, pp. 20–25, 1936.

A list is given of bacterial, fungal, physiological, and other diseases recorded to date on the genus *Coffea*, arranged according to families under the scientific names, together with the common names, other hosts affected, nature of the symptoms, and geographical distribution of the organism or condition; this is followed by a bibliography of 158 titles.

GOKHALE (V. P.). **Preliminary observations on small-leaf disease in Cotton.**—*Indian J. agric. Sci.*, vi, 2, pp. 475–480, 1936.

A survey of the cotton growing tracts of the Bombay Presidency in 1933–4 showed small-leaf disease [? stenosis: *R.A.M.*, xiv, p. 561; xv, p. 648] of cotton to be widespread though it was absent from the southern part of the Surat district and from Khandesh. The disease varies in intensity from year to year but ranged from 5 to 15 per cent. in South Maratha in 1932–3. In the Kaira district it is serious in the first and second ratoons, and the damage to the latter may be as high as 35 per cent. Only herbaceum types were affected and among these none appeared more resistant than the rest. The symptoms of the disease are described in detail. Attempts to transmit the disease by sap, by grafting, and by insects were unsuccessful.

DASTUR (R. H.). **A preliminary note on Cotton failure in the Punjab and some abnormalities in the plant.**—*Indian J. agric. Sci.*, vi, 2, pp. 377–395, 3 pl., 1936.

A disorder of cotton known as red leaf disease [*R.A.M.*, xii, p. 567; xiii, p. 698] is responsible for periodic partial failures of the American

cotton crop in the Punjab. The symptoms are an early reddening of the leaves, poor opening of the bolls with immature seed and low quality lint, and in extreme cases the dwarfing of the plant. Nutrition was suspected as the cause of the trouble, and microchemical studies showed that disintegration of the chloroplasts begins in apparently healthy leaves and is followed by an accumulation of starch in the mesophyll cells. Elongation of the palisade and mesophyll cells results in the crumpling, curling, and thickening of the leaves. Later the cells become filled with yellowish deposits of the nature of tannins, fats, and proteins, while anthocyanins and anthoxanthins form in the epidermis, giving a reddish colour to the leaves.

Small, yellow, granular masses appear in the cortex of the roots, and in the phloem and other conducting parenchyma, reacting with starch to form complex deposits of proteins, fats, and tannins. Similar deposits are also found in the stem, sometimes extending even to the upper parts. These formations occur in more than 50 strains of cotton but do not lead to external manifestations except in the American types and the use of the term red leaf for this disease is therefore deprecated.

Isolations from the leaf, stem, root, and embryo of affected plants have yielded a rod-shaped bacterium with peritrichiate flagella. It is tentatively suggested that this organism is responsible for the destruction of the chloroplasts and the consequent inhibition of metabolic activity, leading to under-nourishment and premature opening of the bolls.

DOUNIN (M. S.) & PONER (V. M.). Озониоз. (Техасская корневая гниль и ее аналоги). [Ozoniosis (Texas root rot and its analogues).]—328 pp., 79 figs., Госуд. Издат. колх.-совх. Литер. „Сельхозгиз" [State Publ. Off. Lit. collect. co-op. Farming 'Selkhozgiz'], Leningrad, 1936. [English summary.]

This is a very complete compilation from the relevant literature [255 titles of which are cited in the appended bibliography] of information on the Texas cotton root rot (*Phymatotrichum omnivorum*) [*R.A.M.*, xv, p. 648], supplemented by some experimental, chiefly confirmatory work by the authors with material imported from the United States. Although the presence of the fungus has been reported several times in the southern and south-eastern districts of the U.S.S.R., careful researches there during 1934 failed to confirm these reports [ibid., xv, p. 422], but as the weather conditions in that year were not favourable to the disease, the respective areas are being still kept under strict observation. In the meantime, in view of the potentialities of *P. omnivorum* for harm, since it is known to be pathogenic to about 900 species of cultivated and wild plants, its introduction into the U.S.S.R. from abroad should be guarded against by strict quarantine measures, and all imported susceptible perennial hosts should be grown for at least two years in experimental stations. Control measures, as applied in the United States, are discussed in detail, and further studies on the biology of the organism are advocated, so that adequate measures may be taken to deal immediately with any infection foci that might be found in the U.S.S.R.

GUILLIERMOND (A.). **L'Eremothecium ashbyii, nouveau champignon parasite des capsules du Cotonnier.** [*Eremothecium ashbyii*, a new fungus parasitic on Cotton bolls.]—*Rev. Mycologie*, N.S., i, 3, pp. 115–156, 2 pl. (1 col.), 25 figs., 1936.

An expanded account is given of the author's study of the fungus isolated from cotton bolls by Massey in the Sudan and referred to [without a Latin diagnosis] as *Eremothecium ashbyii* [*R.A.M.*, xiv, p. 693].

STEYAERT (R. L.). **Le port et la pathologie du Cotonnier. Influence des facteurs météorologiques.** [The habit and pathology of the Cotton plant. The influence of meteorological factors.]—*Publ. Inst. nat. Étud. agron. Congo Belge*, Sér. sci., 9, 32 pp., 1 fig., 23 graphs., 1936.

A fully tabulated account is given of studies conducted in the Belgian Congo in 1934–5 of the effect of different climatic conditions on the development of the cotton plant. The data obtained showed that in the area concerned leaf formation, flowering, and boll development [*R.A.M.*, xv, p. 147] depends particularly on atmospheric temperature, the correlation coefficients relative to this factor being persistently negative and significant, and therefore indicating that in the locality where the investigation was conducted the plants were growing in too high a temperature. Of the humidity coefficients the most important were daily rainfall and relative humidity. *Bacterium malvacearum* is practically non-existent locally [ibid., xiv, p. 223], but internal boll rots merit serious attention, and owing to the losses sustained count as the most important of all the fungal and bacterial affections of cotton; three forms of these rots appear to be present in the Belgian Congo, viz. stigmatomycoses due chiefly to *Nematospora* [*coryli* and *N. gossypii*; ibid., xiv, p. 507; xv, p. 437], bacterial boll rots and an undetermined red rot [loc. cit.], of which those of fungal origin are the most serious. No marked differences in resistance to internal boll rots were noted in four varieties tested. Boll rots externally visible include anthracnose (*Glomerella gossypii*) [ibid., xv, p. 149], fusariosis caused by several as yet undetermined species of *Fusarium* [ibid., xiv, p. 224], and an affection of the carpel due to *Diplodia gossypina* [ibid., xv, p. 215]. A more judiciously chosen sowing date (6th July, locally) will, it is thought, greatly reduce the losses from internal boll rots of fungal origin [ibid., xiv, p. 507]. It is concluded that a survey of all the data obtained demonstrates conclusively that climatic factors are of the greatest importance in cotton growing.

CHARLES (VERA K.). **The synonymy of Botrytis rileyi Farlow.**—*Mycologia*, xxviii, 4, pp. 397–398, 1936.

The fungus received by Petch on *Anticarsia gemmatilis* from Florida and identified by him as *Spicaria prasina* [*R.A.M.*, v, p. 97; vi, p. 229] has been determined by mycologists in the United States as *Botrytis rileyi* [ibid., x, p. 188]. In view of the close similarity of *B. rileyi* with the genus *Spicaria* and the priority of the specific name the author renames the species *S. rileyi* (Farl.) n. comb.

DRECHSLER (C.). **A new species of Stylopage preying on nematodes.**—*Mycologia*, xxviii, 3, pp. 241–246, 1 fig., 1936.

Latin and English diagnoses are given of *Stylopage leiohypha* sp. nov., a parasite of nematodes (*Rhabditis, Cephalobus,* and *Acrobeles* spp.) in Florida celery fields. The fungus differs from *S. hadra* [*R.A.M.*, xiv, p. 508] in its more slender hyphae (2 to 3 μ in width), narrower conidiophores (125 to 300 by 2·5 to 3·5 μ), and smaller conidia (20 to 35 by 7 to 18 μ, average 29·3 by 12·8 μ). Some possible taxonomic relationships of the Zoopagaceae [see next abstract] are briefly discussed.

DRECHSLER (C.). **New conidial Phycomycetes destructive to terricolous amoebae.**—*Mycologia*, xxviii, 4, pp. 363–389, 7 figs., 1936.

Detailed descriptions with Latin and English diagnoses are given of the following new species of Zoopagaceae predacious on amoebae in the United States: *Endocochlus brachysporus, E. gigas, Stylopage rhabdospora, Zoopage atractospora,* and *Z. cladosperma,* all isolated from leaf mould; *Acaulopage cercospora* from muck soil; and *Z. nematospora* from decaying plant materials.

KARLING (J. S.). **A new predacious fungus.**—*Mycologia*, xxviii, 4, pp. 307–320, 5 figs., 1936.

A detailed description is given of *Zoophagus tentaclum* n. sp. [with a diagnosis in English] found growing loosely epiphytic on filaments of *Nitella flexilis* in New Jersey as a predacious parasite of species of *Monostyla* and *Distyla*.

KHARASCH (M. S.), KING (H.), STOLL (A.), & THOMPSON (M. R.). **The new ergot alkaloid.**—*Nature, Lond.*, cxxxvii, 3462, p. 403, 1936.

As a result of the exchange and comparison of the four ergot [*Claviceps purpurea*] alkaloid specimens isolated concurrently and independently in three countries in 1935 [*R.A.M.*, xv, p. 223] the writers (of whom H. King acted in place of the late H. W. Dudley) are agreed that the melting-points, mixed melting-points, and optical activities of the several samples point to their identity. The choice of the recognized name for the new alkaloid—ergometrine, ergotocin, ergobasine, or ergostetrine—is left to the world of science.

MOORE (M.). **The organisms of chromomycosis of North and South America.**—*Science*, N.S., lxxxiii, 2164, pp. 603–604, 1936.

As a result of studies conducted in collaboration with Almeida in Brazil the writer ascertained various important facts bearing on the classification of the agents of chromoblastomycosis. In the first place, as already shown by Mackinnon, *Phialophora verrucosa* is not confined to North America [*R.A.M.*, xv, pp. 220, 503], and a fungus has been recently described from Buenos Aires with the characters of *Phialophora*. Secondly, a careful examination of various fungi known as *Acrotheca* revealed characters, such as branching and conidial formation in heads, which are definitely not those of the genus but approximate to *Botrytis*. Other characters, however, are suggestive rather of the Dematiaceae than of the Mucedinaceae, and a new genus, *Botrytoides*

Moore & Almeida, is therefore proposed to replace *Acrotheca* and *Trichosporium* for the agent of chromoblastomycosis. Thirdly, a *Hormodendrum* [ibid., xiv, p. 509; xv, p. 220] has been isolated from authentic cases of the disease, and finally, an organism recently isolated from a Brazilian patient partakes at various stages of the nature of all the above-mentioned genera. The name proposed for this complex new organism, which apparently connects *Botrytoides*, *Phialophora*, and *Hormodendrum* in a close relationship, is *Phialoconidiophora guggenheimia* Moore & Almeida [without a Latin diagnosis].

CONANT (N. F.). **Studies in the genus Microsporum. I. Cultural studies. II. Biometric studies.**—*Arch. Derm. Syph., Chicago*, xxxiii, 4, pp. 665–683; xxiv, 1, pp. 79–89, 6 figs., 4 graphs, 1936.

Eighteen strains of the following species of *Microsporon* from different sources were studied on various standard media in the hope of finding a reliable basis for specific separation [cf. *R.A.M.*, xv, p. 294]: *M. fulvum* [ibid., xv, p. 440], *M. gypseum* nov. comb., *M. lanosum*, *M. felineum* [ibid., xv, p. 92], *M. equinum* [ibid., xiv, p. 581], *M. simiae* n. sp., *M. pseudosolanosum* n. sp., *M. aurantiacum* n. sp., *M. obesum* n. sp., and *M. audouini*.

The strains showed a great diversity of reaction, involving not only macroscopic but also microscopic changes [which are described in great detail], to the various media and to any given substratum, a fact that is considered to invalidate the use of gross cultural appearances for diagnostic purposes. Spore forms were either produced irregularly or not at all in agar media, whereas on polished rice grains (1 part to 3 of water in 125 c.c. flasks) [cf. ibid., ix, p. 781 *et passim*] these organs developed in profusion.

On the basis of biometric studies on the macroconidia of the above-mentioned species of *Microsporon* on a polished rice medium, the claim to specific rank was judged to be well founded in the cases of *M. fulvum* (average spore length 38 to 40 μ), *M. gypseum* (44 to 48 μ), *M. obesum* (48 to 56 μ), *M. simiae* (54 to 58 μ), *M. equinum* (62 to 66 μ), and *M. lanosum* (70 to 76 μ). The somewhat overlapping curves for *M. pseudolanosum* and *M. aurantiacum* (64 to 68 and 64 to 72 μ, respectively) are less convincing from the standpoint of specific differentiation, but the rusty to orange conidia of the latter are evidently distinct from the light buff organs of the former, while the conidial production in clusters in *M. equinum* readily serves to separate this species from the looser type of spore formation in *M. pseudolanosum*.

CATANEI (A.). **Premières recherches sur les teignes du chien en Algérie.** [Preliminary studies on canine ringworms in Algeria.]—*Arch. Inst. Pasteur Algér.*, xiv, 2, pp. 104–108, 2 pl., 1936.

Clinical and morphological details are given of the three species of fungi isolated from canine ringworms in Algeria, viz., *Microsporon canis* Bodin 1902 (this name being preferred on grounds of priority to *M. felineum* (*M. lanosum*) [see preceding abstract]), *Ctenomyces mentagrophytes* (*Trichophyton asteroides*) [*T. mentagrophytes*], and *Achorion schoenleini*.

Mazzanti (C.). **Dermatite verrucosa micosica americana (malattia di Gilchrist).** [American mycotic verrucose dermatitis (Gilchrist's disease).]—*G. ital. Derm. Sif.*, lxxvii, 3, pp. 363–378, 4 pl., 1936.

Full clinical details are given of a case of verrucose dermatitis contracted in the United States and attributed on the authority of Prof. P. Redaelli to *Gilchristia* [*Endomyces*] *dermatitidis* [*R.A.M.*, xv, p. 295]. Previous records of the disease are summarized and the systematic position of the causal organism discussed.

James (R. F.). **Mold and bacteria killed by new lamp.**—*Food Industr., 1936*, 6, pp. 295–297, 5 figs., 1936.

Details are given of the highly successful results obtained during the last nine years in the control of mould and bacterial spoilage in meat and bakery products [*R.A.M.*, xv, pp. 454, 574] by exposure to the 'sterilamp', a gaseous-conductor tube generating radiant energy of which 90 per cent. is in a strongly germicidal region of the spectrum. It is made in lengths of 10, 20, or 30 in. and only 7 watts of electrical energy are required for the maximum dimension. The lamp operates at a temperature only 4 or 5 degrees above room temperature.

Control of odours and molds by ozone and ionized oxygen.—*Food Industr., 1936*, 6, p. 307, 1936.

Information is stated to be available to the effect that ozone at the rate of 1 or 2 parts per million prevents the development of moulds in eggs [*R.A.M.*, xiv, p. 237] for periods up to 15 months under well-controlled temperature and humidity conditions, while at the extremely high concentration of 5 parts per million it is reported to have actually eliminated existing mould growth on eggs. Ozone has also been used on a small scale to combat moulds of meat [see preceding abstract] and given satisfactory results in the case of lean material; it is, however, liable to affect the flavour of fat. Ionized oxygen has also been successfully used for similar purposes.

White (E. A.), Massey (L. M.), & Blauvelt (W. E.). **Garden Roses.**—*Ext. Bull. Cornell agric. Exp. Sta.* 342, 53 pp., 21 figs., 1936.

In the section of this bulletin dealing with diseases of garden roses, by L. M. Massey (pp. 33–44) notes are given on the symptoms, causal organism and its life-history, and control of black spot (*Diplocarpon rosae* [*R.A.M.*, xv, p. 653], powdery mildew (*Sphaerotheca pannosa*) [ibid., xv, p. 298], brown canker (*Cryptosporella* [*Diaporthe*] *umbrina*) [ibid., xiv, p. 498], and stem canker (*Coniothyrium fuckelii*) [*Leptosphaeria coniothyrium*: ibid., xv, p. 653].

Massey (L. M.) & Lyle (E. W.). **Control of black spot on Roses studied at Cornell.**—*Flor. Rev.*, pp. 19–20, March 5, 1936. [Received September, 1936.]

In this paper the preliminary results are given of an investigation into the control of rose black spot (*Diplocarpon rosae*) [see preceding abstract] under glasshouse conditions carried out at Cornell University. Three years' investigation by the senior author of the temperature and

moisture relations of the fungus demonstrated that little hope can be held out of preventing infection by controlling temperature, and at the same time growing good roses. Varying the humidity, however, gave more promising results. Water as such, or a humidity high enough to indicate the probability of condensation on the foliage, was ascertained to be necessary for spore germination and infection. For infection to take place the plants had to remain continuously wet for over six hours, the period required depending on the temperature. The spores were found to be largely disseminated by the splashing of water from plant to plant and leaf to leaf. The importance of greatly reducing, or if possible eliminating, syringing then became apparent, and experimental evidence was obtained that control of red spider [*Tetranychus telarius*], which became necessary when syringing was discontinued, could be secured by appropriate applications of selocide. The elimination of syringing combined with ordinarily good glasshouse practices effectively held black spot in check, the method being uniformly successful in numerous glasshouses. Even where the disease was threatening to assume epidemic proportions, infection was suppressed when selocide was substituted for syringing, infection being reduced by as much as 99·8 per cent. in 20 weeks. The elimination of syringing also greatly reduced the expense and labour involved in tying up roses of the Talisman type which develop crooked stems after being sprayed unless straightened up. Plants kept free from black spot and red spider held their leaves nearly down to the ground in contrast with 'long-legged' diseased plants. [This paper also appears in *Flor. Exch.*, February 29, 1936.]

MASSEY (L. M.). **The 1935 disease-control campaign.**—*Amer. Rose Annu., 1936*, pp. 110–116, 1936.

The results obtained during 1935 in the control of black spot (*Diplocarpon rosae*) [see preceding abstracts], mildew (*Sphaerotheca pannosa*), and other diseases of the rose by 64 growers, widely scattered in the United States and co-operating in a disease control campaign, are tabulated and analysed. Of the materials used sulphur-lead arsenate dust (90–10) was the most popular (30 growers), followed by tri-ogen (18), and the average number of applications was 25 and 23, respectively. Nineteen growers reported satisfactory control of black spot with the former product and 8 by the latter; and 19 out of 20, and 13 out of 16 satisfactory control of mildew by the two products, respectively. Six growers reported burning from the sulphur-lead dust and 5 from the tri-ogen. Black spot was the most troublesome disease to 33 growers, mildew to 6, five other diseases to one grower each.

LACEY (MARGARET S.). **Studies in bacteriosis. XXII. I. The isolation of a bacterium associated with 'fasciation' of Sweet Peas, 'cauliflower' Strawberry plants and 'leafy gall' of various plants.**—*Ann. appl. Biol.*, xxiii, 2, pp. 302–310, 2 pl., 1936.

The author states that after repeated failures she finally succeeded in isolating a very slow-growing bacterium from fasciated sweet peas [*R.A.M.*, xiv, p. 365], which on inoculation through wounded or unwounded surfaces invariably produced severe fasciation in germinating sweet pea seeds, and which was reisolated with its pathogenicity fully

retained from the latter. 'Leafy galls', characterized by the development of very short, hypertrophied shoots at the base of the plant or cutting, spreading horizontally until a large gall-like mass is produced, the older parts of which rot away but are later replaced by further growth, occur on chrysanthemum [ibid., xiv, p. 635], carnation, and *Schizanthus retusus*. Isolations from these and from 'cauliflower' strawberry plants [ibid., xi, p. 380] yielded a very similar bacterium, which also on inoculation caused severe fasciation of sweet pea seedlings. Marked fasciation also occurred when the seedlings were grown in inoculated sand cultures. The inoculation experiments gave clear evidence that the organism was most pathogenic to the seedlings just after germination; after 17 days the seedlings only became infected through wounds, and only slight fasciation developed on 24-day-old seedlings. The bacterium (which is being studied further) is a Gram-positive, non-motile, and non-acid-fast rod of very variable length, sometimes filamentous in old cultures, and frequently found in groups forming Y, W, or star-shapes, morphologically suggestive of *Bacillus radicicola* or *Bacterium tumefaciens*. It grows slowly on bouillon agar, especially at first, forming round, raised colonies, with entire margin, becoming dense, rather dry, sometimes papillate, sometimes with a narrow flat border, white at first, slowly becoming pinkish-yellow and finally deep yellow, is markedly aerobic, makes no growth at 37° C., with an optimum temperature of 25°, and a thermal death point at about 50°, does not liquefy gelatine or reduce nitrates, and has no diastatic action on starch. A slight variation was observed between the strains isolated from the different hosts in their growth on synthetic sugar media and in their action on litmus milk, but all are considered to belong to one species which has not yet been identified with any other previously known.

Longley (L. E.). **Flower color in 'broken' or mosaic Tulips.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 647–677, 1936.

Out of 80 tulip varieties inoculated at the Minnesota Agricultural Experiment Station by rubbing the leaves with material from mosaic or 'broken' foliage [*R.A.M.*, xv, p. 156], 39 (including *T*[*ulipa*] *elegans*) contracted definite infection in the Early, Cottage, Darwin, Breeder, and Lily Flowering groups, and are listed according to their colour.

Edwards (E. T.). **The witches' broom disease of Lucerne.**—*Sci. Bull. Dep. Agric. N.S.W.* 42, 31 pp., 15 figs., 1936.

This is an amplified account of the writers' studies on the witches' broom disease of lucerne in New South Wales, the principal features of which have been noticed from another source [*R.A.M.*, xiv, p. 516].

Noble (R. J.). **An epiphytotic of ergot in Paspalum in New South Wales.**—*J. Aust. Inst. agric. Sci.*, ii, 2, pp. 76–78, 1936.

The widespread occurrence of ergot (*Claviceps paspali*) [*R.A.M.*, xv, p. 504] on paspalum (*Paspalum dilatatum*) is recorded throughout the coastal areas of New South Wales during the summer of 1935–6. Water couch (*P. distichum*) was also severely affected by the disease, which was observed on *P. urvillei* as well. Meteorological conditions were abnormally moist and cool and frequently resulted in the presence

of films of moisture on the young paspalum seed heads during December, January, and February, when the disease reached its full development in the Sydney area. Enormous quantities of ergots were formed but analysis showed the alkaloid content to be too low (not more than 0·01 per cent. ergotoxin) [cf. above, p. 720] for the material to be of economic value. Few cases of stock poisoning occurred during the early months but more were reported as the ergots matured.

TABAJDY (K.). **A Biborhere rákbetegsége.** [Crimson Clover rot.]—*Mezőgazdasag*, xii, pp. 54–55, 1935. [Abs. in *Herb. Abstr.*, vi, 1, pp. 60–61, 1936.]

Crimson clover (*Trifolium incarnatum*) in Hungary is liable to decay by three fungi, viz., *Sclerotinia trifoliorum* [*R.A.M.*, xv, p. 299], *Mitrula sclerotiorum* [ibid., xiii, p. 519], and *Typhula trifolii* [loc. cit.], a biological study of which is presented. Infection begins to appear in the autumn, when the plants wilt and die back, especially in wet weather, and the spread of the fungi is not prevented by snow. Conditions favouring the development of the clover-rotting organisms include unduly early (August) sowing, resulting in dense autumn stands, excessive use of nitrogen, and failure to practise crop rotation. Other clovers are also susceptible to the fungi under observation, but *T. incarnatum* is their preferred host.

RĂDULESCU (E.). **Die Bedeutung der Züchtung des Lieschgrases (Timothee) auf Rostresistenz.** [The importance of breeding Timothy grass for rust resistance.]—*Züchter*, vii, pp. 324–326, 1935. [Abs. in *Herb. Abstr.*, vi, 1, p. 61, 1936.]

Observations are in progress at the Cluj (Rumania) Plant Breeding Station on the development of lines of *Phleum pratense* resistant to rust [*Puccinia phlei-pratensis*: *R.A.M.*, xv, p. 514]. During the second year of cultivation (1934–5) 11 immune clones showed more vigorous spring growth, tillering, and development after mowing than 14 susceptible ones, while the yields of the former are progressively increasing and those of the latter steadily declining.

UMPLEBY (E.) & SWARBRICK (T.). **The incidence of canker in young cider Apple trees.**—*Rep. agric. hort. Res. Sta. Bristol, 1935*, pp. 98–103, [1936].

Observations on a block of young cider apple trees in the vicinity of Bristol indicated that two forms of apple canker [*Nectria galligena: R.A.M.*, xv, p. 514] exist, of which by far the more prevalent and serious develops through a bud or wound. The other, termed 'paper' canker, consists of large, sunken areas of bark usually along the main stem, the bark in the more advanced stages turning pale and peeling off in thin, paper-like layers. The sudden appearance of the disease in the plot and the virulence of the attack were extraordinary, stems being girdled within a few weeks. High resistance was shown by the Ellis Bitter, Royal Wilding (no canker in approximately 100 trees of each variety) and Silver Cup varieties, while Knotted Kernel, Sweet Alford, and Stoke Red had under 3 per cent. canker in 300 to 400 trees. Kingston Black showed over 40 per cent. canker on 250 trees. Susceptible

varieties, such as Kingston Black, Cap of Liberty, Cowarne Red, and Frederick, should always be head-grafted on a canker-resistant stem builder, for which purpose Bulmer's Norman (reasonably resistant in these trials) and Sweet Alford are recommended. No clear evidence was obtained of any effect of the rootstock on canker susceptibility.

STEVENS (N. E.). **Two species of Physalospora in England.**—*Mycologia*, xxviii, 4, pp. 330–336, 1936.

This paper reports the finding in England of the ascigerous stages of *Physalospora obtusa* [*R.A.M.*, xv, p. 467] on apple and hawthorn (? *Crataegus oxyacantha*) and of *Diplodia mutila* [ibid., xiv, p. 423; xv, p. 701] on apple and ash (*Fraxinus excelsior*). The *Physalospora* stage of the latter has not been recorded before and the author names it *P. mutila* (Fr.) n. comb. [with a diagnosis in English]. The perithecia are borne in the pycnidial or similar stromata, paraphyses are numerous, branched, interwoven, and apparently anastomosing; asci are regularly 8-spored, and ascospores are hyaline, non-septate, a few becoming two-septate, 30 to 39 by 12 to 16 μ mostly 30 to 36 by 13 to 14 μ. The species differs from *P. obtusa* chiefly in the larger size of the ascospores and the size, appearance, and time of colouring of the pycnospores. The folly of attempting to link up stages of fungi of this group on the basis of association was illustrated by the occurrence of *D. sarmentorum* in quantity on the ash stick on which *P. mutila* was found. The distribution and synonymy of *D. sarmentorum* are discussed in detail.

HALPERIN (L.). **Informe sobre el ataque de Sphaeropsis malorum al Manzano en el Delta.** [Report on the attack of *Sphaeropsis malorum* on the Apple in the Delta.]—*Bol. Minist. Agric., B. Aires*, xxxvii, 1–4, pp. 39–49, 7 figs., 1936.

An account is given of the symptomatology and etiology of an apple disease recently observed in seven estates in the Delta region of the Argentine, where it appears to be generally distributed, and unless controlled appears likely to destroy whole orchards. The author attributes the disease to *Physalospora cydoniae*, the pycnidial stage of which he regards as *Sphaeropsis malorum* Berk. [*Diplodia mutila*: see preceding abstract]. Only the pycnidial stage was observed. The pycnospores are described as oblong, ellipsoid, 16 to 36 by 7 to 16 μ, at first hyaline or lightly coloured but gradually becoming dark chestnut [apparently in the pycnidium: in this character resembling *S. malorum* Peck (*P. obtusa*): *R.A.M.*, xiii, p. 312]; only unicellular spores have been observed. The Sarmiento [runner] and Mitre varieties appear to be the most resistant and Jonathan and Winter Banana relatively so. Directions are given for control based on plant sanitation, the use of resistant varieties, and spraying.

CHRISTOPHER (E. P.). **The effect of flotation sulphur spray on the CO_2 assimilation of Apple leaves.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 149–151, 1936.

Data are presented to show that even flotation sulphur, which causes relatively little foliage scorch in comparison with lime-sulphur as a treatment for apple scab [*Venturia inaequalis*: *R.A.M.*, xv, p. 592],

may be responsible for some reduction in the carbon dioxide assimilation of the leaves. Thus, 20-year-old McIntosh trees treated in the orchard in September, 1934, with 1 in 55 flotation sulphur paste, assimilated only 79 per cent. of the amount of carbon dioxide absorbed by the unsprayed foliage, the corresponding figure for Baldwins treated in the greenhouse in the following spring being 82 per cent. This decrease is not nearly as serious as that reported by Hoffman in connexion with lime-sulphur for the same purpose [ibid., xiv, p. 183 and next abstract].

Hoffman (M. B.). **The effect of lime-sulphur spray on the respiration rate of Apple leaves.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 173–176, 1936.

Baldwin apple leaves sprayed with lime-sulphur 1 in 40 at a temperature of 25° C. on 17th June, and at 32° on 18th July, 1934, showed a slightly greater rate of apparent respiration than untreated ones [cf. preceding abstract], but the injury to sprayed foliage is thought to be due less to this factor than to decreased photosynthesis. In the July test the sprayed leaves assimilated on 19th July over 5 mg. less carbon dioxide per hour per 100 sq. cm. of leaf surface than the untreated foliage, whereas the carbon dioxide respired on the two following days averaged 0·9 and 0·38 mg. more.

Clore (W. J.). **The effect of Bordeaux, copper, and calcium sprays upon carbon dioxide intake of Delicious Apple leaves.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 177–179, 1 graph, 1936.

In experiments carried out in Washington on two-year-old Delicious apple whips the carbon dioxide assimilation rates of the leaves treated with 4–4–50 Bordeaux mixture did not differ appreciably from those of the untreated foliage [*R.A.M.*, xiii, p. 35]. Three leaves sprayed with 4–0–50 copper sulphate, however, developed a purplish-brown spotting [ibid., xii, p. 29] over the entire lamina, although there was no decrease in carbon dioxide assimilation. A marked decline in carbon dioxide intake was associated with severe burning in two out of three leaves sprayed with 0–4–50 hydrated lime [see preceding and next abstracts].

Swartwout (H. G.). **Some notes on spray injury.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 180–182, 1936.

In spraying tests on eight commercial apple varieties in Missouri in 1935 severe russeting (78·4 per cent. on Ben Davis and 41·1 per cent. on Delicious) was caused by treatment with a mixture of 1¼ lb. lime-sulphur and 1 lb. lead arsenate in 50 galls. water [see preceding abstracts], the corresponding amounts for a similar mixture containing only ¾ lb. lime-sulphur being 55·9 and 18·1 per cent., respectively, and for ½ lb. on Delicious 16 per cent. The incidence of russeting was reduced by the substitution of dry for liquid lime-sulphur (6 to 100), the former also imparting a superior finish to the fruit. Flotation sulphur and calcium monosulphide [ibid., xv, p. 485] with lead arsenate also caused less russeting than lime-sulphur.

MOORE (M. H.) & MONTGOMERY (H. B. S.). **A field spraying trial of combined fungicide-contact-insecticide sprays in 1935. A progress report.**—*Rep. E. Malling Res. Sta.*, *1935*, pp. 191–197, 1 fig., 2 graphs, 1936.

In further spraying tests with combined fungicide-contact-insecticide sprays at East Malling [*R.A.M.*, xiii, p. 708] better control of scab (*Venturia inaequalis*) on Cox's Orange Pippin apple trees was given by two pre-blossom (followed by post-blossom) applications of lime-sulphur, with lead arsenate and petroleum-oil emulsion than by one. The applications made at green-bud and pink-bud caused severe leaf burn and defoliation. Three applications (pink-bud, petal-fall, and three weeks after) of lime-sulphur with certain added materials gave good control of scab and red spider (*Oligonychus ulmi*) [*Paratetranychus pilosus*]. Trees on stocks V, X, I, or III showed more heavily infected leaves than those on IX, II, XIII, or XVI. The addition of oil-emulsion or lethalate wetting [ibid., xiii, p. 104] to lime-sulphur did not increase its effectiveness.

THOMAS (P. H.). **The control of black spot in Pears.**—*Fruit World, Melbourne*, xxxvii, 6, p. 7, 1936.

In spraying experiments for the control of black spot [scab] of pears (*Venturia pirina*) in Tasmania during the 1934–35 season, the application to the Beurré Bosc and Winter Nelis varieties of strong Bordeaux mixture (6–4–40 diminishing gradually to 1½–2–40 for the fifth and sixth applications) resulted in 97 per cent. marketable pears, whilst weak Bordeaux (4–4–40 to 1–1–40) gave 94 per cent. and the unsprayed controls 13 per cent. The omission of the calyx spray reduced the percentage of marketable fruit to 60.

DAVIS (L. D.) & TUFTS (W. P.). **Black-end of Pears. III.**—*Proc. Amer. Soc. hort. Sci.*, *1935*, xxxiii, pp. 304–315, 4 figs., 2 graphs, 1936.

Black end, a limiting factor in Californian pear production [*R.A.M.*, xii, p. 615 and next abstract], has been observed during a lengthy investigation period not to spread from tree to tree in the orchard, but individuals maintain their relative position with respect to the severity of the disease from year to year. In other words, the tendency of a tree to produce diseased fruits neither increases nor declines with advancing age. Field experiments have clearly demonstrated the importance of *Pyrus serotina* rootstocks in the etiology of the disease, and details are given of the satisfactory performance of severely affected Bartlett trees cured by the severance of the connexion between the scion and the stock, for which inarches of *P. communis* were substituted. In other tests scaffold branches, separated from the main tree and grafted on *P. communis* inarches, bore normal fruit while the portions of the tree still attached to the *P. serotina* stock continued to produce black end pears. Promising results have also been given by the use of quince stocks.

Attention is drawn to various unusual features in this rootstock effect, including, besides the above-mentioned stability of individual reactions, the virtual absence of symptoms on the tree itself as distinct from the fruit.

Negative results were given by attempts to improve the condition of the trees by drastic pruning, soil treatments, and chemical injections.

DAVIS (L. D.) & MOORE (N. P.). **Black-end of Pears. IV. P_H of Bartlett Pear fruits.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 316–322, 2 figs., 1936.

Laboratory and field data are presented indicating that a connexion exists between the hydrogen-ion concentration of Bartlett pear juice and the occurrence of black end [see preceding abstract], which is liable to be associated with increasing alkalinity (P_H 4·60 to 4·90 at the most severely affected calyx end compared with 4·10 to 4·35 for healthy fruit in one orchard test). The exact nature of this relationship is still obscure.

BEARD (F. H.) & WORMALD (H.). **Bacterial canker of Plum trees in relation to nutrition. Experimental results in sand cultures.**—*Rep. E. Malling Res. Sta., 1935*, pp. 146–152, 1936.

In an experiment designed to ascertain whether the susceptibility of plum trees to bacterial canker (*Pseudomonas mors-prunorum*) could be modified by increasing or decreasing the amounts of certain minerals present in the soil [*R.A.M.*, xiii, p. 710] 42 two-year-old Victoria plum trees worked on myrobolan A stock were planted in pots containing pure sand and fed with the following nutrient solutions, viz., (1) complete nutrient solution, (2) double nitrogen, (3) low nitrogen, (4) half potassium, (5) no potassium, (6) quadruple phosphate, and (7) low phosphate. Eventually the stems were inoculated with *P. mors-prunorum*. The average lengths of the resultant cankers in the seven series listed above were, respectively, 33, 17, 20, 14, 17, 38, and 3 cm., the low phosphate treatment markedly reducing susceptibility to canker. Cankering was most severe in the quadruple phosphate and complete series (the latter relatively high in potassium), but with the exception of one tree, was low in the half potash series. Until further information is available heavy dressings of potash or phosphatic fertilizers should not be applied to soils in which plum bacterial canker is prevalent.

In an appendix by W. A. Roach (pp. 152–154) it is stated that a study of the availability of the iron in the culture solutions indicated that the degree of resistance to canker was sufficiently parallel to both the acidity of the culture solution and the availability of the iron to raise the question whether it may depend on a highly acid growth medium or one rich in iron or a combination of both [cf. ibid., xv, p. 110]; further investigations are in progress.

WORMALD (H.). **Notes on the silver leaf disease.**—*Rep. E. Malling Res. Sta., 1935*, pp. 155–157, 2 figs., 1936.

The rapid infection and dying-off of four young plum trees is recorded following inoculation with cultures of *Stereum purpureum* [*R.A.M.*, xv, p. 676]; the fungus penetrated throughout the stem and into the roots to a maximum distance of 3 ft. 9 in. from the point of inoculation in 10½ months. A comparable instance of rapid infection was observed on a naturally infected double-grafted pear. A cankered area with papery

bark extended about 9 in. downwards from the upper union, whence infection appeared to have spread into the rootstock in about six months.

PITTMAN (H. A.). **Exanthema of Citrus, Japanese Plums and Apple trees in Western Australia.**—*J. Dep. Agric. W. Aust.*, xiii, 2, pp. 187–193, 4 figs., 1936.

Brief descriptions are given of the symptoms and occurrence of exanthema of citrus [*R.A.M.*, xiv, pp. 505, 628] and of Japanese plums [? *Prunus salicina*: ibid., ix, p. 192] in Western Australia.

A peculiar blistering of the bark on rapidly growing shoots of Granny Smith apple trees on poor, gravelly soils has been encountered on several occasions, and since the trouble yields to soil applications of copper sulphate the author considers that it can be included under the term exanthema [ibid., vii, p. 643]. Control measures should be based on careful selection of site, especially for oranges, the application of stable manure or a well-balanced fertilizer, the use of green manures, efficient drainage, and the application to the soil of copper sulphate ($2\frac{1}{4}$ or 3 lb. per tree, shortly after the autumn rains begin, followed in subsequent years by one-quarter of this amount), or by spraying with Bordeaux mixture.

HOAGLAND (D. R.), CHANDLER (W. H.), & HIBBARD (P. L.). **Little-leaf or rosette of fruit trees. V. Effect of zinc on the growth of plants of various types in controlled soil and water culture experiments.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 131–141, 9 figs., 1936.

Little leaf [*R.A.M.*, xiv, p. 767] symptoms were experimentally induced on apricot seedlings and nursery trees, Turkish tobacco, Santa Clara Cannery tomatoes, yellow mustard, summer squash, Golden Bantam maize (the appearance of which resembled that of 'white bud' plants [ibid., xiv, p. 576]), Sacramento barley, Russian Mammoth sunflower, and Acala cotton (*a*) in a sandy subsoil from a diseased peach orchard at Delhi, California, and (*b*) in water cultures in which zinc was omitted from the nutrient solution. Grimm's lucerne remained apparently unaffected by the absence of zinc, as might be expected from its good growth in little leaf orchards. In apricots a necrotic condition further developed as a result of boron deficiency in the nutrient solution used in the water culture experiments, and it was shown that 0·5 p.p.m. of this element was necessary to ensure proper growth. Commercial dried sheep manure, at the rate of 50 gm. per 2-gall. jar, completely prevented little leaf on all the plants (except maize) grown in zinc-deficient soil, while zinc sulphate, as in the previous year's experiments, exerted a uniformly beneficial effect when applied to the soil in solutions of 0·10 to 0·20 gm. per 10 kg.

HARTZELL (A.). **Incubation period of Peach yellows in its insect vector.**—*Contr. Boyce Thompson Inst.*, viii, 2, pp. 113–120, 1 fig., 1936.

The incubation period of the virus of peach yellows [*R.A.M.*, xv, p. 587] in its insect vector (*Macropsis trimaculata*) was determined by allowing nymphs collected from wild plum (*Prunus americana*) and

tested for non-infectivity to feed for periods of 1, 4, 7, and 10 days while caged on yellowed peach seedlings, and then transferring them to healthy peach seedlings where they fed for periods of from 1 to 24 days. From 4 to 20 insects were used in each test.

The results showed that 7 or 14·6 per cent. of the trees became infected and only nymphs of the 4-day series transmitted the disease. The maximum incubation period of the virus within the insect was found to range from 10 to 26 days with an average of 16 days. The minimum period observed was from 7 to 8 days. All infections were obtained with insects that had been infected in the nymph stage except in one instance in which the leafhoppers had reached the adult stage before being exposed to infection. In this case the maximum incubation period in the insect was 26 days. The incubation period of the virus in the peach tree was from June and July to the following February and March.

CANONACO (A.). **Il seccume dei rametti di Mandorlo in relazione ad alcuni micromiceti.** [Withering of Almond branches in relation to certain micromycetes.]—*Riv. Pat. veg.*, xxvi, 5–6, pp. 145–164, 1 pl., 1 fig., 1936.

Almond trees growing in the vicinity of Palermo showed a withering of the young branches and death of the buds attributed to a fungus which the author names *Phomopsis amygdalina* n. sp. [with a Latin diagnosis]. The fungus is characterized by depressed, globose, subepidermal, later erumpent pycnidia measuring 180 to 300 μ in diameter (up to 520 μ when confluent), filiform or subulate sporophores, 10 to 12 by 1·5 to 2 μ, and fusoid or ovate-fusoid, hyaline α-spores seldom exceeding 5 to 8 by 1·8 to 2·5 μ. The fungus probably infects the stems through leaf scars in the autumn and continues development round the buds, as long as weather conditions allow, killing the shoots and branches. It resumes activity in the spring and forms pycnidia. In culture the fungus grew fairly readily on decoctions of carrot and almond with agar added but pycnidia developed only occasionally. Infection experiments are not described. The paper terminates with notes on prevention and control by improved cultural methods and spraying with Bordeaux mixture or lime-sulphur.

SPINKS (G. T.) & CLOTHIER (G. E.). **The incidence of 'reversion' in seedling Black Currants and in clones derived from them.**—*Rep. agric. hort. Res. Sta. Bristol, 1935*, pp. 58–66, [1936].

Observations on the incidence of reversion [*R.A.M.*, ix, p. 599] on about 2,500 seedling black currants and clones from selected seedlings (the seedlings being produced by crossing or self-fertilizing standard varieties and raised primarily to obtain new varieties), showed that most of the seedlings remained healthy for six years, but the disease was found on a few four-year-old plants. Some clones from apparently healthy seedlings became severely affected within four years, though others remained free for ten. Systematic roguing of infected clones for two years largely eliminated visible signs of the disease, but reverted plants appeared again after a further two years. In some cases the

disease may have reappeared after remaining latent during the two years, though in others the infections appeared to be new.

MASSEE (A. M.). **Studies on the transmission of the Strawberry virus 'yellow-edge' disease by insects. II. Aphis transmission experiments and period of infectibility.**—*Rep. E. Malling Res. Sta., 1935*, pp. 171–176, 1936.

Further investigations at East Malling confirmed the earlier finding that the strawberry yellow edge virus is transmitted by the delicate strawberry aphid (*Capitophorus fragaefolii* Cockll.) with which *Myzus fragaefolii* and *C. fragariae* are synonymous [*R.A.M.*, xiv, p. 596]. Transmission by the insect occurred in May, June, and July. Five aphids were enough to effect transmission from a diseased to a healthy plant, the symptoms of the disease appearing seven weeks after inoculation.

OGILVIE (L.) & THOMPSON (C. R.). **A Strawberry disease resembling the American 'crimp'.**—*Rep. agric. hort. Res. Sta. Bristol, 1935*, pp. 76–79, 1 pl., [1936].

Since 1929 strawberries of the Madame Kooi variety grown in the Cheddar area have been affected by a condition resembling crimp or dwarf [*R.A.M.*, x, p. 42; xi, p. 380]. The leaflets are markedly 'ballooned', with turned-down edges, brittle, dark, and often show transverse corrugations. Large, pale green, later dark brown, necrotic areas may develop on the leaflets and petioles. The tips of the runners may be swollen, and the fruit of abnormal shape. Symptoms resembling 'red plant' may be present. Experimental evidence showed that soil sterilization by steaming reduced infection, which is attributed to the nematode *Aphelenchoides fragariae.* No typical 'cauliflower plants' [above, p. 724] were found either at Cheddar or in the experimental plots.

FOËX (E.) & LANSADE (M.). **Une bactériose du Bananier.** [A bacteriosis of the Banana.]—*C.R. Acad. Sci., Paris*, ccii, 26, pp. 2173–2175, 1936.

From the vascular and parenchymal tissues of bananas received from Beyrouth (Syria), where they are subject to an internal greyish-yellow to brown or black rot extending from the terminal bud to the collar and resulting in cessation of growth, the writers isolated *Fusarium moniliforme* [*Gibberella fujikuroi*] var. *subglutinans* [*R.A.M.*, xii, p. 382; xv, p. 359], the pathogenicity of which was shown by inoculations to be very limited, and four bacteria, one of which (4B) produced on *Musa basjoo* S. & Z. and *M. sapientum* symptoms corresponding to those observed in nature. The organism is motile by one to three polar flagella, 1·3 by 0·4 μ, Gram-negative, non-acid-fast, liquefying gelatine, not coagulating milk, reducing nitrates, or fermenting carbohydrates, producing ammonia, and growing on Fermi's but not on Uschinsky's medium; it is named *Bacterium maublancii* n. sp.

SCHNELLHARDT (O. F.) & HEALD (F. D.). **A study of the toxic action on gray-mold spores of cleaning solutions used in spray residue removal.**—*Phytopathology*, xxvi, 6, pp. 564–577, 2 figs., 1936.

One of the two principal agents of decay in stored apples in Washington is *Botrytis cinerea* [*R.A.M.*, x, p. 675], the other being *Penicillium*

expansum [ibid., xiii, p. 781]. The washing tank is a prolific source of contamination by *B. cinerea*, becoming contaminated by spores from the surface of normal fruit, from an occasional decayed apple passing into the machine, and from atmospheric dust. Of the three cleaners commonly used in the removal of spray residue from the fruit, sodium silicate [ibid., xiv, p. 173] at a concentration of 75 lb. per 100 galls. water proved to be the most toxic to *B. cinerea* spore suspensions, killing 95·5 per cent. of the spores in five minutes at room temperature and all in the same time at 90° F., in three minutes at 100°, in two at 110°, and in one at 120°. Hydrochloric acid at a strength of 3 per cent. by volume destroyed 81·3 per cent. of the spores in 104 hours at room temperature and all in 25 to 36 hours at 90°, in 7 at 100°, and in 15 minutes at 120°. At 90° and room temperature the spore percentages killed by sodium carbonate (75 lb. per 100 galls.) in 101 hours were 100 and 98·8, respectively, the periods required for complete killing at 110° and 120° being 11 hours and 20 minutes, respectively. The corresponding figures for the elimination of the spores in the control flasks of water alone are given.

The practical conclusion from these experiments is that the risk of grey mould infection during washing operations may be largely obviated by the use of sodium silicate at relatively high temperatures. Recently the practice of tandem or double washes to clean lead arsenate-sprayed fruit has been adopted, and excellent results may be obtained by the treatment of apples, first with hydrochloric acid and then with sodium silicate or vice versa. Should a milder alkali be preferred to sodium silicate, sodium carbonate-trisodium phosphate or soda ash may be substituted.

McCallan (S. E. A.) & Wilcoxon (F.). **The action of fungous spores on Bordeaux mixture.**—*Contr. Boyce Thompson Inst.*, viii, 2, pp. 151–165, 2 figs., 4 graphs, 1936.

By using sodium diethyl dithiocarbamate which gives a yellowish colour with very dilute ammoniacal copper solutions [*R.A.M.*, x, p. 475; xv, p. 505] the mother liquor of freshly prepared 4–4–50 Bordeaux mixture was shown to contain about 1 p.p.m. of soluble copper. The amount of copper that goes into solution in distilled water in contact with dried Bordeaux deposit did not exceed 0·3 p.p.m., an amount insufficient to affect the germination of most species. But when the filtrate from a spore suspension (prepared by a vacuum technique without allowing contamination with the nutrient medium and allowed to stand several hours) was placed over dried Bordeaux mixture the copper dissolved varied with the species and was directly proportional to the number of spores. For extracts of 100,000,000 spores the values in mg. were as follows: *Uromyces caryophyllinus* 1·01, *Sclerotinia fructicola* 0·76, *Neurospora sitophila* 0·12, *Botrytis paeoniae* 0·10, *Glomerella cingulata* 0·046, *Aspergillus niger* 0·023, and *Alternaria solani* 0·013. Those species most active in bringing copper into solution excreted the greatest amount of solids and were also the most sensitive to the toxic action of Bordeaux mixture.

Ultrafiltration tests showed that the active material in spore excretions is in true solution. By collecting 360,000,000,000 spores of *Neuro-*

spora sitophila a quantity of spore excretion was obtained and chemical determinations indicated the presence of 3·1 per cent. malic acid and 0·75 per cent. amino nitrogen. Spore excretions are practically neutral and cannot act from any acidic properties. Copper as sodium cuprimalate and as a copper glycine derivative was found to exert a toxicity substantially the same as in the form of copper sulphate and the authors conclude that the salts of hydroxy acids as well as of amino acids present in spore excretions act on Bordeaux mixture to form soluble toxic copper hydroxy and copper amino salts.

BEELEY (F.). **The F.M.S. Government scheme for the testing and approval of fungicides for the treatment of mouldy rot on Rubber trees.**—*Malay. agric. J.*, xxiv, 6, pp. 257–267, 1 graph, 1936.

The difficulty of disinfecting the delicate cambial tissues, exposed in the tapping of rubber, against mouldy rot (*Ceratostomella fimbriata*) led to the testing of proprietary preparations available on the Malayan market to determine those most suitable for use. From this beginning the author traces the development of the present organization for the testing and approval of disinfectants by the Rubber Research Institute [*R.A.M.*, xi, p. 768]. Under this scheme the cost of testing is borne by the proprietor who has to deposit $200 with the Institute before a test is undertaken, and to guarantee that the formula for the composition of the preparation will not be changed without sanction. The Institute has the right of publication of results of tests whether good or bad and the receipt of more than three complaints may entail the removal of a product from the white list. At present the approved substances are agrisol, izal, black cyllin, killgerm, kilsol red, brunolinum plantarium [ibid., x, p. 550], agrisol white, cargillineum B [ibid., xii, p. 597], and durycolium.

A detailed description is given of the laboratory and field tests formulated for the testing of these substances. Penetration tests on living bark are made to determine injury. Laboratory tests showed the toxicity of products to cultures of *C. fimbriata* to be so low as to afford no indication of value for mouldy rot control. Better results were obtained by the following method. Clean strips of living bark, 6 by 1 by $\frac{1}{4}$ in. are placed in sterile tubes and inoculated with *C. fimbriata*. A sporing culture is obtained in 7 days when it is immersed in the fungicide under test and scrapings of the fungus removed at short intervals for 30 mins. for washing and culturing. This test is, however, so inferior to the field test that the latter is considered the only suitable final test of the efficacy of a fungicide for mouldy rot control. In carrying out field tests plots of 25 trees, each showing complete infection of the panel, are selected in a heavily infected area, the neighbouring trees serving as controls. The tests are carried out at different concentrations to determine the probable minimum strength required to kill the fungus and the maximum strength at which the fungicide can be applied to the bark without injury. When treatment is stopped the time required for the reappearance of mould is noted. Preparations are rejected which fail to control the disease during a period of one month and which injure the bark at or near the strength required for killing.

[This paper is reprinted in the *J. Rubb. Res. Inst.*, vii, 1, pp. 8–19, 1936.]

PETRI (L.). **Se ed in quali limiti i composti del rame possano essere sostituiti da altri sali metallici o da altri prodotti nazionali nella fabbricazione degli anticrittogamici.** [Whether, and within what limits, copper compounds can be replaced by other metallic salts or national products in the manufacture of fungicides.]—*Nuovi Ann. Agric., Roma*, xvi, 2, pp. 81–92, 1936.

After fully discussing the results obtained in recent years in different countries and particularly in Italy from investigations into the possibility of replacing copper compounds in fungicides by cheaper or home-made materials, the author concludes that copper-lime and copper-sodium sprays and colloidal preparations with a copper salts base should be replaced by alkaline polysulphides in the case of diseases amenable to control by sulphur compounds, such as *Venturia pirina*, *V. inaequalis*, *Exoascus* [*Taphrina*] *deformans*, *Cycloconium oleaginum*, and many others. Against diseases caused by species of *Botrytis* copper fungicides may be replaced by either alum and gypsum, aluminium sulphate and gypsum or lime, calcium bisulphite, or sodium bisulphite. Aluminium sulphate can be used to protect seedlings against *Rhizoctonia* infection from the soil [*R.A.M.*, xii, p. 269 *et passim*], seed disinfection of certain plants can be effected with zinc oxide, wounds can be disinfected with zinc chloride (especially against bacteria), and potato tubers can be protected against black scurf [*Corticium solani*] with mercuric chloride. The concentration of copper sprays should be reduced, especially in those localities where spring is not accompanied by frequent rain. A well-organized system of warning growers of the likelihood of vine mildew [*Plasmopara viticola*] outbreaks would reduce the number of spray applications to a minimum. The author also recommends that attempts should be made to produce a fungicide with an organic mercury salt basis, which possesses adhesive properties and does not burn the foliage.

KEARNS (H. G. H.), MARSH (R. W.), & MARTIN (H.). **Combined washes. Progress report. II.**—*Rep. agric. hort. Res. Sta. Bristol, 1935*, pp. 37–48, [1936].

In 1935, further extensive field trials with combined insecticidal-fungicidal sprays were arranged at Long Ashton [*R.A.M.*, xiv, p. 701], but owing to a total loss of crop as a result of frost it was impossible to assess the value of some of the materials. The data obtained, however, showed, *inter alia*, that a refined white oil (5 per cent.) emulsified with sulphite lye and mixed with 3 per cent. lime-sulphur was safely applied to apple varieties at the green flower stage, and is probably not less effective in the control of scab [*Venturia inaequalis*] than lime-sulphur alone.

JOËSSEL (P. H.) & SUAU (J.). **Produits mouillants ou adhésifs dans les traitements mixtes contre le Carpocapse et la tavelure.** [Wetting or adhesive agents in combined treatments against codling moth and scab.]—*Ann Épiphyt.*, N.S., ii, 1, pp. 31–49, 1936.

A detailed account is given of a series of comparative tests in which Beurré Giffard pear trees were sprayed against codling moth [*Cydia pomonella*] and scab [*Venturia pirina*] with arsenical and cryolite Bor-

deaux mixture with the addition of casein as an adhesive, amyl alcohol as a wetter, or a combined adhesive and wetter, i.e., either biliary salts, colloidal resin, or sulphonate terpenic alcohol [cf. *R.A.M.*, xv, p. 590]. Results were obtained regarding the insecticidal efficacy of the sprays but practically no scab developed on the treated trees or the controls during the period of the experiment.

DUTTON (W. C.) & FARISH (L. R.). **Comparisons of high-calcium and dolomitic hydrated limes in Bordeaux, zinc-lime and iron-lime on Cherry and Peach.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 186–190, 1936.

In experiments carried out on Montmorency cherries at the Michigan Agricultural Experiment Station to compare the value of high-calcium and dolomitic hydrated limes used as constituents of Bordeaux mixture [*R.A.M.*, xiv, p. 677] it was found that with both kinds of lime at the strengths used (2–3–100, 4–6–100, 6–9–100, and 8–12–100) terminal growth diminished in 1934 as the strength of the mixture increased owing possibly to drought effects being accentuated by the Bordeaux, whereas in 1935 these relations were in general reversed. Bordeaux in any form was shown to be liable to accentuate the normal leaf-fall of cherries due to drought and on the whole the injury was more pronounced with high calcium than with dolomitic lime. The latter part of the paper concerns the use of iron-lime and zinc-lime as arsenical correctives on the peach.

KADOW (K. J.), RUTH (W. A.), & ANDERSON (H. W.). **Greenhouse wires and pipes galvanized with zinc react with sulphur dioxide to form soluble zinc salts.**—*Phytopathology*, xxvi, 6, pp. 609–610, 1936.

Tomatoes in Illinois greenhouses were severely injured in 1935 by the zinc thiosulphate, or the oxidized product zinc sulphate, formed by the reaction of the zinc-galvanized wires and pipes with the sulphur dioxide used in fumigation for the control of various diseases [*R.A.M.*, xii, p. 524]. The crystals on the galvanized surfaces slowly dissolved in condensed moisture and the resultant solution dripped on to the plants, causing brownish-black to black lesions.

CHILDERS (N. F.). **Some effects of sprays on the growth and transpiration of Tomatoes.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 532–535, 1936.

Over ten-day periods of low (January) and high (April) evaporation periods in Missouri in 1934, the application of 3–4–50 Bordeaux mixture to mature Marglobe tomatoes in the greenhouse was virtually without effect on the total amount of water transpired [*R.A.M.*, xiv, p. 708 and above, p. 727]. Bordeaux plus heavy oil (0·6 per cent.), copper sulphate, and colloidal copper (each at 1 in 500) had little effect, the tendency, if any, being toward a decrease, but heavy oil alone caused a marked though only temporary reduction in the transpiration rate, especially under high evaporation conditions. In field tests the Bordeaux treatment (particularly in the absence of oil) caused a noticeable reduction

in plant growth, yield, and fruit size during extremely dry weather, under which conditions it should probably be omitted unless absolutely indispensable from the disease control standpoint.

VERGUIN (J.). **Les produits chimiques et la défense des cultures.** [Chemical products and crop protection.]—*Rev. Chim. industr.*, xlv, 530, pp. 38–44; 531, pp. 58–63; 532, pp. 90–100, 1936.

This is a review, followed by a seven-page bibliography, of some outstanding contemporary investigations on the application of a number of fungicidal, insecticidal, and adhesive substances to crop protection. Most of the relevant literature has been noticed from time to time in this *Review*.

BLANK (I. H.) & TIFFNEY (W. N.). **The use of ultra-violet irradiated culture media for securing bacteria-free cultures of Saprolegnia.**—*Mycologia*, xxviii, 4, pp. 324–329, 1 fig., 1936.

Bacteria-free cultures of *Saprolegnia* were readily obtained from contaminated material by cultivation on a medium (5 ml. per 4·5 cm. Petri dish) composed of peptone 1 gm., levulose 5 gm., agar 20 gm. per l. and exposed to ultra-violet rays for 3 hours before use. The inhibition of bacteria is due to the presence of a growth-inhibiting substance resulting from the action of the rays on the carbohydrate constituent of the medium. Little or no inhibition of fungus growth was observed. Any of the common carbohydrates may be used for the medium, but the concentration of proteins should be kept low. The method is thought to be applicable to the isolation of other fungi.

RAWLINS (T. E.) & TOMPKINS (C. M.). **Studies on the effect of carborundum as an abrasive in plant virus inoculations.**—*Phytopathology*, xxvi, 6, pp. 578–587, 1 fig., 1936.

Details are given of the technique and results of experiments in the transmission of various plant viruses by means of abrasion of the leaves with 600-mesh powdered carborundum, dusted over the surface through the small apertures of a salt-shaker prior to the application of the virus suspension with sterilized absorbent cotton. The method proved successful in the case of spotted wilt of tomato and lettuce [*R.A.M.*, xv, p. 538], broad bean [*Vicia faba*] mosaic, a Californian celery mosaic [ibid., xv, p. 191], cauliflower mosaic [ibid., xiv, p. 207], and sugar beet mosaic, considerably increasing the percentages of infection over those obtained by the standard technique of rubbing.

It was shown by histological examination that the epidermal cells of leaves thus inoculated are frequently pierced by the carborundum crystals which, however, presumably do not injure the tissues sufficiently to prevent the multiplication of the virus within them.

RAYNER (M. C[HEVELEY]). **The mycorrhizal habit in relation to forestry. II. Organic composts and the growth of young trees.**—*Forestry*, x, 1, pp. 1–22, 6 pl., 6 graphs, 1 diag., 1936.

In continuation of her studies on the growth effect on seedling conifers produced by the addition of certain organic composts to soils

in which the young trees suffer high mortality and marked inhibition of growth [*R.A.M.*, xiv, p. 410] the author gives comparative growth records on Scots pine (*Pinus sylvestris*), Corsican pine [*P. laricio*], and *P. contorta* var. *murrayana* in graphical form showing the average heights and height frequencies in control and treated populations in field plots, with dry weight records for the corresponding pot cultures. The composts used were prepared from straw, sawdust, dried blood, brewery hop waste, ammonium sulphate, and ammonium phosphate in various combinations and proportions, the nitrogen being added at one hundredth the air dry weight of the composting material. Each compost was added at the rate of 10 lb. per sq. yd.

As compared with the controls the root systems of treated plants showed an abundance of short roots with profuse mycorrhizal development. *Boletus bovinus* was isolated from mycorrhiza of treated plants and is believed to be present throughout the soil of the experimental area but is inhibited by factors not fully determined. The addition of certain composts relieves this condition, permitting normal activity of the mycelium.

In the series of pot culture experiments the results were in close agreement with those obtained from the field plots. Different reactions to the same compost was shown by the individual species of pine used, and especially so, in another series of tests, by larch. Experimental evidence was also obtained from pot cultures in potting soil that tomato and wallflower (which do not form mycorrhiza) and Scots pine showed no improved growth as the result of compost addition, whereas treated *Solanum dulcamara* and *Nicotiana* spp. (which form mycorrhiza) gave higher dry weights than the untreated.

The author concludes that these composts, by modifying the course of humus decomposition, bring about qualitative changes in the organic soil constituents deleterious to growth, whereby products are formed markedly beneficial to nutrition, growth, and mycorrhizal development of young conifers. The action of the composts is essentially different from manures containing significant additions of available nutrients. The relation of these results to current biological theories of soil ecology and mycorrhizal habit is briefly discussed.

DYKSTRA (T. P.). **Comparative studies of some European and American Potato viruses.**—*Phytopathology*, xxvi, 6, pp. 597–606, 4 figs., 1936.

Comparisons of certain European and American potato viruses were made at Corvallis, Oregon, on a number of varieties from both continents [*R.A.M.*, xv, p. 459]. The X virus was found to resemble the so-called latent virus of 'healthy' American commercial potatoes. Both the Y virus and the veinbanding virus (rugose mosaic minus the X component) produce a banding of the veins on tobacco leaves and belong to the same group, though they are not identical. Whereas the tuber-perpetuated veinbanding symptoms are manifested on most American varieties containing the X virus by necrosis of the lower leaf veins, without leaf drop, those infected by the tuber-perpetuated Y virus showed not only extensive foliar necrosis but also considerable leaf drop, while Bliss Triumph also developed necrosis of the petioles and stem striation.

Para-crinkle produces large, irregular, mosaic-like blotches on the foliage of American varieties quite distinct from the symptoms due to leaf-rolling mosaic [ibid., xii, p. 48] or any other American potato virus. Under cages in the field, pinpoint-like necrotic lesions, in addition to mottling, developed on the leaves of infected Burbanks.

Crinkle A [ibid., ix, p. 603; xii, p. 48] is composed of at least one other virus besides X, and the virus free from X produces symptoms similar to those of the corresponding components of mild mosaic and crinkle mosaic, but somewhat different in pattern and with less severe foliar crinkling. Virus C (Di Vernon top necrosis), described by Bawden in an unpublished thesis referred to by K. M. Smith [ibid., xii, p. 776], produced a severe top necrosis in the form of current season symptoms in all the American varieties tested. The X component which accompanies virus C was removed by grafting scions from affected plants on to the resistant seedling No. 41956. The C virus, which does not correspond with any of the known viruses occurring in the United States, was successfully transferred from the resistant seedling to President and Majestic.

Taylor (C. F.) & Blodgett (F. M.). **Further field experiments on Potato scab control in western New York.**—*Amer. Potato J.*, xiii, 6, pp. 145–150, 1936.

Further experiments in the control of potato scab [*Actinomyces scabies*] in a region of western New York where the soil averages at least P_H 6·0 [*R.A.M.*, xiii, p. 537; xv, p. 603] showed that seed treatment with hot or cold formalin consistently reduced the incidence of infection, which was increased, on the other hand, by the use of mercurial preparations either on the tubers or incorporated with the soil. The use of sulphate of ammonia as a constituent of the fertilizer was found to decrease tuber defects to a considerable extent.

The Netted Gem variety possesses a fairly high degree of resistance to serious scab injury under local conditions. White Blossom Cobbler is more resistant than Irish Cobbler, while within the Smooth Rural group, Pioneer Rural and Robson Seedling are slightly less susceptible to the disease than Heavyweight and No. 9.

Butcher (F. G.). **Studies of seasonal occurrence of injuries to Potato tubers in western New York.**—*J. econ. Ent.*, xxix, 3, pp. 486–490, 1 fig., 1 graph, 1936.

In connexion with a study from 1932 to 1935 of the seasonal occurrence of scab [*Actinomyces scabies*], scab-gnat (larvae of Sciarid flies), and millipede injuries on potato tubers in western New York, it was observed that the incidence of scab lesions consistently declined from 31st August to 10th October (59·1 per cent. on the former date and 22·48 on the latter in 1935). This phenomenon was accompanied by a steady increase of similar proportions in millipede damage, and it is suggested that the disappearance of the scab infections was due to the feeding of the insects on them. Scab-gnat injury apparently follows invasion by the fungus, and the data for this type of damage indicate that the millipedes also feed on the areas of larval infestation.

MARTYN (E. B.). **The diseases of Rice in British Guiana.**—*Agric. J. Brit. Guiana*, vii, 2, pp. 142–143, 1936.

Brief notes are given on the following diseases of rice recorded in British Guiana: blast (*Piricularia oryzae*) [*R.A.M.*, vi, p. 212; cf. xv, p. 255] does little harm and has only been found on the Blue Stick variety; man rice (*Fusarium moniliforme*) [*G. moniliformis*: ibid., xiv, p. 217; xv, p. 173] causes only negligible damage; mildewed heads (*Acrothecium lunatum* [*Curvularia lunata*: ibid., xiii, p. 357] and *Clasterosporium punctiforme*) [loc. cit.] occur during wet weather or in humid conditions; and sclerotium disease (*Sclerotium oryzae*) [*Leptosphaeria salvinii*: ibid., xv, p. 313] has recently reappeared on the Blue Stick variety, causing a large percentage of empty grains. Bunt (*Tilletia horrida*) [ibid., xiv, p. 222] has not been reported for some years.

ABE (T.). **Comparison of pathogenicity in different culture strains of Piricularia oryzae and varietal susceptibility of the Rice plant to the blast disease.**—*Ann. phytopath. Soc. Japan*, vi, 1, pp. 15–26, 1936. [Japanese, with English summary.]

The pathogenicity of various strains of the rice blast fungus (*Piricularia oryzae*) [*R.A.M.*, xv, p. 312] used in inoculation experiments on the leaves was definitely lower in the booting than in the seedling stage, but, apart from this, distinct differences were observed in the virulence of the individual strains, of which IX and XIII caused the most severe damage, followed by XXII, XVIII, and XX, which were rather weak, V being extremely feeble, while VII and XVII were innocuous to mature plants. Strain IX was the most injurious to the spike pedicels, followed by XIII, XII, and XXII in the order named. Nos. XX and XVIII were moderately pathogenic to these organs, V weakly so, and VII and XVII of negligible importance. These results are virtually in complete accordance with those obtained on mature plants. In a trial comprising 16 rice varieties from four localities of Japan, strain X was the most strongly pathogenic to all, while an almost equal degree of infection was induced by V and XVIII, the former perhaps being slightly the more virulent. On the basis of seed inoculation tests, using the highly pathogenic strain IX, the most resistant varieties were found to be Igô, Bôzutamagawa, Mubôaikoku, Kamezi No. 3, and Aikoku, Waseôno, Kinaiwase Nos. 68 and 69, and Kômyônisiki being very susceptible, and Toyokuni, Tôgô, and Kinaiwase 22 intermediate in their reaction.

KLETSCHETOFF (A. N.) **New species of Colletotrichum on the rubber-producing plant Taraxacum kok-saghyz Rodin.**—*C.R. Acad. Sci. U.S.S.R.*, N.S., ii, 4, pp. 161–163, 1 fig., 1936.

The author [who transliterates his surname KLEČETOV] gives a brief account of a hitherto undescribed species of *Colletotrichum*, which is named *C. taraxaci* [with a Latin diagnosis], found on brownish spots on the scapes of *Taraxacum kok-saghyz* (a plant which is being experimentally cultivated as a possible source of rubber) in the Kursk area. The oblong or rounded acervuli, 34 to 86 by 20 to 43 μ, are each provided with one to six setae, 116 to 220 by 2·8 μ; the conidia measure 16 to 23 by 2·8 μ in diameter. Preliminary inoculation tests indicated

that *C. taraxaci* is capable of attacking and killing germinating *T. kok-saghyz* seeds.

FELSZ-KARNICKA (HALINA). **Rozkład cellulozy w glebach kwaśnych.** [Decomposition of cellulose in acid soils.]—*Mém. Inst. polon. Écon. rur.*, xvi (*1935*), 1, 48 pp., 7 pl., 1 fig., 1 graph, 1936. [French summary.]

A full description is given of investigations in 1933 and 1934 on the soil-inhabiting organisms responsible for the decomposition of cellulose in acid soils in Poland, a preliminary account of which has already been noticed [*R.A.M.*, xv, p. 526]. The results showed that in such soils the decomposition of cellulose is caused, not by bacteria, but, apart from a limited number of Actinomycetes, almost exclusively by fungi, of which 14 species are recorded [all of which are described and figured], viz. *Chaetomium spirale*, *C. kunzeanum* [*C. globosum*], *C. indicum*, *Mycogone puccinioides* [*Monotospora daleae* Mason] (a species characteristic of such soils), *Oedocephalum glomerulosum* [ibid., xii, p. 191], *Papulospora nigra*, *Trichoderma lignorum*, *Stachybotrys lobulata*, *Dicoccum asperum*, *Chaetophoma* sp., *Chaetomium* sp., *Blastotrichum* sp., *Botrytis* sp., and an unidentified species; neither *C. indicum*, *O. glomerulosum*, *P. nigra* nor any of the five last-named appears to have been previously included among cellulose-decomposing organisms. The number of cellulose dissolving fungi in the acid Sobieszyn soils varied from 400 to 4,000 per gm. The application of stable manure and nitrogen fertilizers increased both the soil acidity and the variety and number of the mould flora, while lime and basic fertilizers produced an opposite effect, with a corresponding reduction in the energy of cellulose decomposition. In neutral soils, in which cellulose was decomposed more rapidly and energetically than in acid soils, the process was chiefly due to the activity of bacteria.

HARRIS (R. V.). **The Verticillium wilt of Hops. Some facts and recommendations.**—*Rep. E. Malling Res. Sta., 1935*, pp. 158–162, 1 graph, 1936.

In 1934–5, further cases of the wilt of Fuggles hops caused by *Verticillium albo-atrum* [*R.A.M.*, xv, p. 462] were recorded in England, where seven serious centres of attack have been reported to date. A varying proportion of the bines of affected hills die during the growing season. The affected bines are abnormally thickened, being most conspicuously swollen at the base, but the bark does not become discoloured until the disease has reached a late stage. When the wilt starts in June or July the leaves generally become rapidly and uniformly yellow, then black, those at the base changing colour first; if the condition starts later on in the season, the first symptom is usually an interveinal yellowing and withering of the lower leaves, extending upwards and culminating in a wilting and brown discoloration of the cones. In severe cases all the bines of a hill may be wilted or dead before picking.

Primary infection appears to take place from the soil, and the main seat of the fungus thenceforward is the underground part of the hill. A hill severely affected one year may be free from dead and wilting bines the following year. Records extending over ten years indicate

that the pathogen is found in most of the hills in affected gardens irrespective of the wilting of the bines before picking and that intensity of wilting is primarily related to fluctuations in seasonal and soil conditions. A wet season is accompanied by severe wilt, and vice versa. Preliminary soil surveys of infected gardens showed that a remarkable parallelism exists between the soil structures and textures in all the affected gardens in Kent and Sussex, and that there is a striking correlation between intensity of attack and impedence in soil drainage. Experiments are in progress to ascertain the effect of improved soil drainage on control.

Ogilvie (L.). **Sclerotinia wilt of the Hop.**—*Rep. agric. hort. Res. Sta. Bristol, 1935*, pp. 107–109, 1 pl., [1936].

A detailed account is given of the epidemic outbreak of *Sclerotinia sclerotiorum* on hops in Herefordshire and Worcestershire in 1935 [*R.A.M.*, xiv, p. 792; xv, p. 425]. At the base of wilted bines a straw-coloured area several inches long was found, usually near the ground, and mycelium of the fungus and later sclerotia occurred within the stem. Important factors in the epidemic were probably the presence of the fungus on weeds in the headlands, viz., on nettles [*Urtica*], hemlock [*Conium maculatum*], and hogweed [*Heracleum sphondylium*], and the occurrence of late frosts which injured the bines and permitted wholesale infection to take place. The outbreak died down when the bines recovered from the effects of the frosts. The suppression of weeds, destruction of diseased material, and the uncovering of earthed-up hills to allow the affected bines to dry up, are recommended for purposes of control.

MacLachlan (J. D.). **The Pimento rust disease.**—*J. Jamaica agric. Soc.*, xl, 5, pp. 277–281, 1936.

In this preliminary, semi-popular account of the rust (*Puccinia psidii*) [*R.A.M.*, xiv, p. 792] of pimento (*Pimenta officinalis*) in Jamaica, the author states that it takes 14 hrs. from the beginning of germination until the germ-tube successfully penetrates the leaf surface and ten to twelve days more until spores are produced. Two strains of the rust are present in Jamaica, one commonly attacking the rose apple (*Eugenia jambosa*) [*E. jambos*] and infecting otaheite apple (*E. malaccensis*) in the laboratory, and the other occurring on pimento and found also on a single tree of bay rum (*P. acris*); the pathogenicity of the rust to the latter host was confirmed by inoculation experiments. The pimento strain is unable to infect the rose apple, and vice versa, but no morphological differences are apparent between the two strains.

The rust is capable of infecting only young organs, and the presence of young seedling trees therefore assists its spread. Damp weather and a low temperature also favour infection. Laboratory studies showed that the optimum temperature for the infection process is about 60° F.; between 55° and 70° infection was repeatedly obtained, above 70° it was inhibited, and above 80° none took place. These findings are substantiated by the intensity of infection at various altitudes, as shown by data from 82 replies obtained in response to a questionnaire, viz. above 2,000 ft. rust was severe with practically no crop, between 1,000

and 2,000 ft. one-third of the growers reported the rust as affecting the crop yield, severely in a very few cases, and below 1,000 ft. 99 per cent. of the crop has been collected where the rust is either not present or doing no material damage. The author considers that the majority of growers at the low altitudes will not be materially affected by the rust.

As regards control, neither eradication, breeding, nor spraying seem applicable, but the author recommends the removal of dead trees and at low altitudes the cutting out and burning of diseased branches of young trees to prevent blossom infection, a procedure already tested and found efficient. The planting of pimento seedlings in regions not invaded by the rust is not recommended until two years has elapsed and the rust has reached an equilibrium in its ability to spread.

Barbacka (Krystyna). **Helminthosporium na Maku uprawnym (Helminthosporium papaveris K. Sawada).** [*Helminthosporium* on cultivated Poppy (*Helminthosporium papaveris* K. Sawada).]—*Mém. Inst. polon. Écon. rur.*, xvi (*1935*), 1, 14 pp., 2 pl., 4 figs., 1936. [English summary.]

Although this is the first official record of *Helminthosporium papaveris* Sawada [*R.A.M.*, x, p. 206] from Poland, the fungus is stated to be of common occurrence on cultivated poppy (*Papaver* spp.) in the province of Lublin, where it causes a serious damping-off of the seedlings, and also attacks the poppy-heads and more rarely the leaves and stalks. The disease is, however, less severe in Poland than in Bulgaria. In dealing with the morphology of the parasite, it is pointed out that the conidia produced locally measured 20 to 97 by 4·5 to 8·3 μ, as against 12 to 81 by 3 to 6 μ given by Christoff, this difference being believed to be caused by environmental conditions, or possibly to be due to the diversity of the host varieties grown in the two countries. The author further confirmed the genetic connexion between *H. papaveris* and *Pleospora calvescens* [loc. cit.], and accepts Christoff's identification of *P. papaveracea* with it. The fungus often referred to *Dendryphium penicillatum* [ibid., xiii, p. 10] is also undoubtedly the same species.

H. papaveris grows readily on various media but best on poppy decoction plus 2 per cent. glucose with a P_H 6·5 to 7·8. Acidity of the poppy medium decreases during the growth of the fungus, whereas that of a mineral medium increases. Marked variations were observed in the response of different varieties of the cultivated poppy to attack by *H. papaveris*. Wild poppies (*P. rhoeas*) growing close to diseased plants were never seen to be infected, and artificial infection of their heads succeeded only in a very few cases. Poppy seed disinfection with a 0·25 per cent. formalin solution greatly reduced seedling infection. Spraying with Bordeaux mixture also gave a good measure of control but is considered to be uneconomical.

Ingram (J. W.) & Summers (E. M.). **Transmission of Sugarcane mosaic by the rusty Plum aphid, Hysteroneura setariae.**—*J. agric. Res.*, lii, 11, pp. 879–887, 1936.

A summarized account is given of experiments from 1933 to 1935, inclusive, the results of which showed that the rusty plum aphid (*Hysteroneura setariae*) is a vector of sugar-cane mosaic [*R.A.M.*, xv, p. 528].

Although in the experiments it was markedly less effective than *Aphis maidis* in the transmission of the disease (only 24 out of 419 (5·2 per cent.) healthy sugar-cane plants exposed to viruliferous *H. setariae* became infected, as against 17 out of 72 (23·3 per cent.) for *A. maidis*), the facts that it is generally distributed on plums throughout most of the United States, with grasses as alternate hosts, and that it feeds on the sugar-cane (usually at the collar lobe at the junction of the leaf blade and the sheath) throughout the year may account for the specific instances of sugar-cane mosaic spread in early summer, in the total absence of *A. maidis*.

The work also indicated the possibility of the transmission of the sugar-cane mosaic by the green bug (*Toxoptera graminum*), since out of 28 healthy plants exposed to its feeding two contracted mosaic.

McClean (A. P. D.) & Halse (R. H.). **Streak disease of Sugar-cane: its economic importance in South Africa.**—Reprinted from *Proc. S. Afr. Sug.* (*Tech.*) *Ass., 1936*, 11 pp., 1 diag., 1936.

An account is given of four years' observations made in South Africa on the prevalence of streak disease [*R.A.M.*, xv, p. 462] in the Uba variety of sugar-cane. An endeavour was made to estimate as accurately as possible the amount of infection present in each district by a method [which is described] necessitating the inspection of only a small proportion of the total number of plants in the district.

Out of a total of 556 fields examined not one contained Uba entirely free from streak. Infection ranged from 2 to 100 per cent. In Zululand, the total areas of plant and ratoon cane showed, respectively, 90 and 92 per cent. infection. In Natal, north of Durban, the corresponding figures were 19 and 26 per cent., and south of Durban 48 and 62 per cent. The [tabulated] data indicate that in the cane area as a whole approximately 60 per cent. of all Uba cane is affected, an increase of nearly 100 per cent. on Storey's estimate of ten years ago.

As Uba, though readily becoming infected, possesses a fair amount of tolerance, the importance of the disease has not been realized sufficiently by most growers, and little or no attempt has been made to prevent transmission by setts. This factor has largely contributed to the prevalence of streak in many districts, though secondary spread by *Cicadulina mbila* must also have played an important part.

The estimated loss in yield for Uba cane in 1934–5, based on the result of the survey and a figure of 11 per cent. loss of weight on the plant crop due to the disease [ibid., iv, p. 123], determined by field experiments at the South African Sugar Experiment Station, amounts to 241,220 tons, valued at £170,864.

Since 1930, eight new commercial sugar-cane varieties have been released in South Africa. Preliminary observations showed that, of these, CH 64/21 is very susceptible, Co. 290 and P.O.J. 2725 are resistant, while P.O.J. 2714, 2727, 2878, and Co. 281 are very resistant. Co. 290, Co. 281, P.O.J. 2878, and P.O.J. 2725 are the most popular of the new varieties, and the control of streak will depend on the amount of resistance they show. The P.O.J. 2878 plants were found to be affected in one locality, but no infection has been observed on Co. 281, P.O.J. 2727 or P.O.J. 2714. Although P.O.J. 2725 and Co. 290 acquire some

infection in the field, their resistance is sufficiently high to enable secondary infection to be reasonably well controlled by direct methods. There is every prospect that the incidence of streak disease will be reduced to negligible proportions when Uba is extensively replaced by these varieties.

Shear (C. L.). **Uniformity and stability of mycological nomenclature.**—*Mycologia*, xxviii, 4, pp. 337–346, 1936.

The author is of opinion that the stabilization of generic and specific names and the fixing of their application are the greatest needs of systematic mycology at the present time. Original generic diagnoses are often inadequate and in many cases no satisfactory description or concept has been attached to a genus until many years have expired, making it very difficult to say when it was 'validly published'. The author maintains that stability and uniformity cannot be attained by the application of the rules of priority but can be accomplished to a great degree by the selection of such type species and specimens as will fix the names as they are generally applied at present. Instances are cited in support of this thesis. The appointment of a standing committee of international systematic mycologists to prepare a list of accepted genera typified by selected types is urged.

Radoslavoff (A.). **VI** приносъ къмъ паразитната гжбна флора на България. [Sixth contribution to the flora of parasitic fungi in Bulgaria.]—*Bull. Soc. bot. Bulgarie*, vii, pp. 51–55, 1936. [German summary.]

A very briefly annotated list is given of 36 species of parasitic fungi, most of which are stated to have been found and studied in herbarium material preserved at the Royal Natural History Museum in Sofia. Mention may be made of *Cystopus bliti* [*R.A.M.*, xi, p. 75] on *Amaranthus retroflexus* and *A. blitum*; *Uromyces pisi* on *Lathyrus pratensis*, a new host in Bulgaria; *Puccinia porri* [ibid., xiv, pp. 423, 735] on *Allium carinatum* and *A. atroviolaceum*, the latter being a new host in the country; and *P. menthae* [ibid., xv, p. 527] on *Mentha viridis*.

Christoff (A.) & Christova (Eleonora). Нѣколко нови растителни болести за България (III приносъ). [Some new plant diseases for Bulgaria. (3rd Contribution).]—*Bull. Soc. bot. Bulgarie*, vii, pp. 7–22, 1936. [English summary.]

This is a briefly annotated list of 34 parasitic fungi, which are stated to be new records from Bulgaria, and among which the following may be mentioned, namely, *Taphrina ulmi* on *Ulmus campestris*, *T. polysporus* on *Acer campestre*, *Uromyces anthyllidis* on *Lupinus angustifolius*, *Puccinia obtusata* on *Ligustrum vulgare*, *Phyllosticta pruni-avium* on *Prunus avium*, *Phoma persicae* on brown, gumming lesions on peach stems [*R.A.M.*, xiv, p. 15], *P. subvelata* on vegetable marrow causing an internal rot of the fruit, *Phomopsis* (*Diaporthe*) *juglandina* on immature fruits of the walnut (*Juglans regia*), *Hendersonia foliorum* on the stems of quince nursery stock (*Cydonia vulgaris*), *H. mali* on the apple, *Septoria secalis* on rye, *Leptothyrium pomi* on the apple, cherry plum (*Prunus divaricata*), and walnut, *Gloeodes pomigena* on the apple, pear,

and plum, *Helminthosporium turcicum* on maize and *Sorghum saccharatum*, *Cercospora violae* on the violet, *Fusarium sclerotium* [*F. scirpi*: ibid., xv, p. 531] on watermelon [*Citrullus vulgaris*] causing a rot of the fruit, and *Sclerotium omnivorum* on groundnut attacking both the collar and the fruits [ibid., xiv, p. 215]. *Nigrospora oryzae* was identified on maize [ibid., xiii, p. 762] and on cotton plants; while this is the first authentic record of this fungus from Bulgaria, the examination of a diseased maize cob preserved at the Obraztzoff regional Agricultural Experiment Station and labelled in 1909 by Bubák under the name *Coniosporium gečevi* [ibid., x, p. 725] showed that the fungus in reality is *N. oryzae*, and the author considers that both names are synonymous. Another herbarium maize cob, collected in 1909 and labelled *Kozarowia majdosperda* Bubák was found to contain *N. oryzae* associated with the former, which is believed to be a secondary organism. The form found on cotton bolls was morphologically very similar to that on maize, for which reason the author refers it to *N. oryzae*, in spite of the fact that a similar fungus has been described by Jaczewski under the name *N. gossypii* [ibid., ix, p. 307].

WALLACE (G. B.). **Second list of fungi and diseases of economic plants in Tanganyika Territory.**—*Kew Bull., 1936*, 3, pp. 234–240, 1936.

A further list, arranged in alphabetical order of the hosts, is given of the fungi, bacteria, and diseases (physiological and virus) affecting 50 plants of economic importance in Tanganyika Territory [*R.A.M.*, xi, p. 474], with addenda on three entomogenous fungi and a supplementary list of the living hosts of *Armillaria mellea* [cf. ibid., xv, p. 261].

HÖHNK (W.). **On three Pythiaceous Oomycetes.**—*Beih. bot. Zbl.*, lv, Abt. A, 1, pp. 89–99, 4 figs., 1936.

The author retains the genus *Pythiomorpha* [*R.A.M.*, xiv, p. 119] for two of the species (one new) recorded in this paper, considering that it differs from *Phytophthora* in the distinctly constricted intramatrical hyphae, the sexual apparatus, the saprophytic or semi-parasitic mode of life, and the more or less aquatic habitat. The third species is placed in the new genus *Diosporangium* of the Pythiaceae distinguished from *Pythium* in the escape of the zoospores without the formation of a vesicle. It agrees with *Pythiogeton* in the orientation of the sporangium, the longer axis of which is at right angles to the stalk, but differs in the regular, symmetrical shape of the sporangium, the thickening of the wall, in the formation of spores inside the sporangium (the plasma content rarely escaping by a creeping movement) and in the oogonia. The type species *D. jonesianum* was isolated from soil from the United States and Germany and in inoculation experiments readily attacked radish and buckwheat (*Fagopyrum*) [*esculentum*] seedlings. Latin diagnoses of the new genus and species are given.

TAI (F. L.). **Notes on Chinese fungi. VI.**—*Bull. Chin. bot. Soc.*, ii, 1, pp. 16–28, 7 figs., 1936.

Continuing his studies on Chinese Erysiphaceae [*R.A.M.*, xiv, p. 795], the writer gives critical and taxonomic notes on a further 16 species, one of which, *Uncinula cedrelae* on *Cedrela sinensis*, with a var. *nodulosa*

on the same host, is new and is supplied with a Latin diagnosis. The list further includes *Erysiphe polygoni* [ibid., xv, p. 585] on buckwheat and a number of other economic and ornamental plants, *Sphaerotheca humuli* var. *fuliginea* [ibid., xii, pp. 396, 500] on beans (*Phaseolus vulgaris*), *P. mungo*, and cowpea, *Microsphaera alni* [ibid., xii, p. 725; cf. also xiv, p. 795] on *Pistacia chinensis*, *M. yamadai* on walnut, and *U. kenjiana* on *Ulmus pumila*.

GADD (C. H.). **Report of the Mycologist for 1935.**—*Bull. Tea Res. Inst. Ceylon*, 13, pp. 24–34, 1 pl., 1936.

The study of root disease caused by *Poria hypolateritia* [*R.A.M.*, xv, pp. 78, 610] was continued during 1935 at St. Coombs, where evidence was obtained indicating that at least two years may elapse before an infected bush dies. The common procedure of trenching and removal of dead or obviously dying bushes does not effectively control the disease, and more drastic methods are necessary involving the removal of every bush infected at the roots even if the bush appears healthy above ground. The necessity of treating the patch as a whole is emphasized.

A die-back of tea branches during the first year from pruning reported in 1929 was again prevalent in several districts in 1935. *Leptothyrium theae* [ibid., vii, p. 745] was consistently isolated from diseased branches, and inoculations through wounds on young tea shoots maintained in water caused a similar die-back of the shoot. The disease starts as a small depressed spot on the young green branch. Frequently the spots are numerous and affected areas enlarge, encircling the stem and killing the upper part. The fungus advances toward the base and enters the parent branch; when it becomes established at the collar death of the bush is likely to ensue. *L. theae* was frequently isolated from diseased tissue at the collar of such bushes. So far early infections have been found on green stems only.

A new disease of *Crotalaria anagyroides* and *C. usaramoensis* was observed in the Hatton and Maskeliya districts, respectively. The leaves bear numerous irregular spots dark purple or almost black in colour, up to 3 to 4 mm. in diam. Later the leaflets fall leaving the petioles bare. The disease was shown by infection experiments to be caused by a species of *Ceratophorum*. It is considered likely to prove a serious handicap to the cultivation of *Crotalaria* as green manure in certain districts.

Gliricidia was found to be attacked by a disease which caused the formation of sunken spots, dark purple to almost black in colour on branches up to $\frac{1}{2}$ in. in diameter. The cortex over the cankers frequently falls off, exposing the wood. The cankers usually encircle the stems and the upper part of the branch dies. Fructifications of the causal organism, a species of *Phoma* with pycnidia 70 to 150 μ in diameter and oval hyaline spores 6 by 3 μ, are formed on the lesions.

A species of *Phyllosticta* was associated with large blotches on the leaves of *Clitoria cajanifolia* grown as hedges, and *Rosellinia arcuata* [ibid., xv, p. 686] was recorded on roots of *Tephrosia vogelii*.

In experiments on wood rot the ambrosia fungus and *Nectria haematococca* [ibid., xiv, p. 742] isolated from discoloured wood failed to induce wood rot unaided.

CARPENTER (P. H.). **Report by the Chief Scientific Officer, Indian Tea Association, 1935 (Resumé).**—12 pp., 1936.

In the section of this report dealing with mycology (pp. 6–8) the author states that in 1935 black rot [*Corticium invisum* and *C. theae*: *R.A.M.*, x, p. 345] of tea caused serious losses in some gardens in north-eastern India, but in most localities was inexpensively controlled by prompt treatment with 1 per cent. Burgundy mixture. Experimental evidence indicated that 4 per cent. Burgundy mixture gave complete control of the disease, while concentrations of 1 and 2 per cent. very greatly reduced infection.

The death of many tea bushes was associated with violet root rot (*Sphaerostilbe repens*) [ibid., xv, p. 271] on very stiff, and *Diplodia* disease [*Botryodiplodia theobromae* secondary to physiological causes: ibid., viii, p. 746; x, p. 345; xi, p. 768] on very sandy, soils. Both conditions appear to be associated with lack of starch reserves in the tea bushes due to excessive reduction in leaf area as a result of heavy plucking or premature defoliation.

The incidence of brown blight (*Glomerella cingulata*) [ibid., xiv, p. 721] attack was ascertained to vary with the severity of plucking. Manuring appeared to have no effect on the proportion of blighted to total leaves below the plucking level, though bushes given 80 lb. nitrogenous manure per acre had smaller starch reserves than others given half this quantity or none at all. [The full report is published in *Rept. mycol. bot. bact. Br., Indian Tea Ass., 1935*, pp. 1–22, 1936.]

BÖNING (K.). **Die wichtigsten Krankheiten des Tabaks.** [The most important diseases of Tobacco.]—*Nachr. SchädlBekämpf., Leverkusen*, xi, 2, pp. 53–86, 24 figs., 1936. [English, French, and Spanish summaries on pp. 105–106, 107–108, 110–111.]

Semi-popular notes are given on the etiology, symptomatology, and control of a number of important fungal, bacterial, virus, and physiological diseases affecting the tobacco crop in Germany and Central Europe generally.

BELTYUKOVA (Mme K. I.) & POPOVA (Mme A. A.). Бактериальное увядание Махорки. [Bacterial wilt of Indian Tobacco.]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна (ВИТИМ)* [*The A. I. Mikoyan pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind. (VITIM)*], Krasnodar, *Publ.* 126, pp. 57–63, 1936.

Bacterial wilt (*Bacillus carotovorus*) [*R.A.M.*, xiv, p. 658] occurred in epidemic form in 1932 on *Nicotiana rustica* in several Indian tobacco-growing areas of European Russia and in West Siberia, infection varying from 4 to 12 per cent., and being most severe on heavy and moist loam soils. It was experimentally shown that the organism is capable of infecting Indian tobacco through stem wounds and from suspensions placed in the leaf axils, and there was clear evidence that topping the plants may play an important part in the distribution of the wilt. Low air temperatures and high humidity appear to favour the development of the disease. Considerable variations were noticed in the varietal susceptibility of Indian tobacco, the varieties with compact and firm

stems of the Vyssokoroslaya Zelionaya [Tall Green] type showing the highest resistance.

Lebedeva (Mme O. P.), Samotzvetova (Mme E. A.), & Beltyukova (Mme K. I.). О бактериальной рябухе Махорки и сигарного Табака и возбудителях ее. [Bacterial 'ryaboukha' of Indian Tobacco and cigar Tobacco, and its causal agents.]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна (ВИТИМ).* [*The A. I. Mikoyan Pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 126, pp. 5–16, 1936.

The results of studies made in 1931 in the Ukraine and central and south-west Russia showed that of the three forms of bacterial 'ryaboukha' [*R.A.M.*, x, p. 627] present there the most widespread and destructive is that which isolations and inoculations have proved to be caused by *Phytomonas tabaca* [*Bacterium tabacum*: ibid., xv, p. 536]. The organism attacks Indian tobacco (*Nicotiana rustica*) plants at all stages of growth, and forms lesions on the leaves and seed capsules of both tobacco and Indian tobacco. The two forms of the disease, caused by *P. heterocea* [ibid., x, p. 628] and *P.* [*Bact.*] *pseudozoogloeae* [ibid., xiv, p. 659], respectively, only occur locally and sporadically, and do not appear to be of economic importance.

Samotzvetova (Mme E. A.). Семена, как источник заражения бактериальней рябухой. [Seeds as carriers of bacterial 'ryaboukha' infection.]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*) [*The A. I. Mikoyan Pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 126, pp. 51–56, 1936.

The results of the laboratory and field experiments briefly discussed in this paper showed that the seeds of Indian tobacco (*Nicotiana rustica*) from plants infected with one of the forms of bacterial 'ryaboukha' (*Phytomonas tabaca* [*Bacterium tabacum*], *P. heterocea*, or *Bact. pseudozoogloeae*) [see preceding abstract] become contaminated in threshing with the corresponding bacterial organism. The latter remains viable on the surface of the seeds until the next sowing time, and may cause infection of the resulting Indian tobacco seedlings; *Bact. tabacum* was also shown to lower the germinability of the seeds by rotting the developing germ. Surface sterilization of infected seed with 0·1 per cent. mercuric chloride, followed by rinsing in sterilized water, effectively controlled the disease.

Obermeister (N. P.). Определение Bact. tab. серологическим методом. [Serological determination of *Bacterium tabacum*].—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*) [*The A. I. Mikoyan Pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 127, pp. 35–47, 3 figs., 1 graph, 1936. [English summary.]

Details are given of serological studies, the results of which showed that strains of *Bacterium tabacum*, *Phytomonas heterocea* [see preceding abstracts], and *Bact. angulatum* [*R.A.M.*, xv, p. 613], obtained from various leaf spots on tobacco and Indian tobacco (*Nicotiana rustica*)

from different regions in the U.S.S.R., were serologically indistinguishable from one another, inasmuch as each was agglutinated by rabbit serum immunized against the others. It is therefore concluded that the three species are identical [cf. ibid., x, p. 62] though biochemically the three organisms vary in their production of hydrogen sulphide or ammonia, or in the reduction of nitrates. The author considers that the serological method may be usefully employed in the diagnosis of tobacco leaf spots, as well as in the microbiological analysis of tobacco seeds, on which *Bact. tabacum* was shown to retain its viability for at least two years.

Beltyukova (Mme K. I.) & Lebedeva (Mme O. P.). О специализации **Phytomonas tabaca Wo. and Fo.** на некоторых растениях хозяевах. [On the specialization of *Phytomonas tabaca* Wolf & Foster on certain host plants.] *Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*) [*The A. I. Mikoyan Pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 126, pp. 17–34, 1936.

The results of investigations from 1930 to 1933, inclusive, showed that in the U.S.S.R. tobacco fields *Phytomonas tabaca* [*Bacterium tabacum*: see preceding abstracts] occurs on the weeds *Amaranthus retroflexus*, *Euphorbia virgata*, *Agrostemma gitago*, and *Chenopodium album*, and *P. heterocea* [loc. cit.] on *Lappa major*, *Trifolium arvense*, and *C. album*; the strains of both bacteria isolated from these hosts were pathogenic to Indian tobacco (*Nicotiana rustica*). Inoculations through wounds or on uninjured plant surfaces showed that *Bact. tabacum* is also pathogenic to 45 host species [*R.A.M.*, xv, p. 678], belonging to 14 families, and including the potato, tomato, *Solanum nigrum*, *Datura stramonium*, *Hyoscyamus niger*, cucurbits, sunflower, beet, French bean (*Phaseolus vulgaris*), soy-bean, and opium poppy.

Lebedeva (Mme O. P.) & Beltyukova (Mme K. I.). Жизнеспособность и вирулентность **Phytomonas tabaca** в главнейших источниках заражения в условиях зимовки. [Viability and virulence of *Phytomonas tabaca* overwintering in materials providing the principal sources of infection.]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*) [*The A. I. Mikoyan Pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 126, pp. 35–49, 1936.

A brief but fully tabulated account is given of experiments in 1931 and 1932, the results of which showed that *Phytomonas tabaca* [*Bacterium tabacum*: see preceding abstracts] retains its viability throughout the winter in sterilized soil, dry tobacco leaves, and in decomposing plant materials both on and under the surface of the soil; it rapidly dies out in unsterilized soil and completely rotted plant tissues. The virulence of the organism is fully maintained in dry leaves, on the surface of tobacco seeds, and sometimes also in semi-rotted plant refuse. On the other substrata tested, e.g., glass slides, wood, and straw, the virulence is considerably attenuated or completely destroyed, but lowered virulence may be increased by several passages of the bacterium through tobacco.

Grooshevoy (S. E.) & Levykh (P. M.). Влияние температуры и влажности почвы на развитие главнейших грибных болезней Табачной рассады. [Effect of soil temperature and moisture on the development of the principal diseases of Tobacco seedlings.]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*) [*The A. I. Mikoyan Pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 127, pp. 5–18, 1936. [English summary.]

A detailed account is given of controlled experiments on the effect of soil moisture content and temperature on the development and injuriousness of *Thielaviopsis basicola*, *Rhizoctonia* sp., *Pythium* sp. [*R.A.M.*, xv, pp. 178, 613], and *Asterocystis radicis* [ibid., xv, p. 531], which, together with *Botrytis cinerea*, are stated to be the most frequently associated in the U.S.S.R. with damping-off of tobacco seedlings in glasshouses. The results showed that *T. basicola* was equally destructive at all the soil humidities (40 to 100 per cent.) tested, and caused the heaviest losses at soil temperatures between 16° and 19° C. The optimum for *Rhizoctonia* sp. was soil humidity from 60 to 80 per cent. and temperatures from 22° to 25°; no attack of the seedlings occurred below 10°. *Pythium* sp. and *A. radicis* were most destructive near the soil moisture saturation point, the optimum temperatures being 16° to 19° for *Pythium* sp. and 16° to 25° for *A. radicis*.

Grooshevoy (S. E.) & Levykh (P. M.). Термический метод обеззараживания парникового субстрата. [Thermal method for the disinfection of seed-bed soil.]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*) [*The A. I. Mikoyan Pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 127, pp. 19–34, 2 figs., 1936. [English summary.]

A tabulated account is given of experiments in 1934 and 1935, the results of which showed that effective control of damping-off of tobacco seedlings due to *Thielaviopsis basicola* [see preceding abstract] is obtained by heating the compost used in the seed-beds at 85° to 95° C. for one hour provided only chlamydospores are present, or for 45 minutes at 100° if the compost contains dried tobacco seedlings infected with the fungus. *Sclerotinia* sp. was killed by heating at 60° for 30 minutes, *Rhizoctonia* [*Corticium*] *solani* at 80° for 30 minutes, and *Asterocystis radicis* at 100° for 45 minutes. In the case of *T. basicola* the depth of the sterilized layer should not be less than 8 to 10 cm. It is pointed out that sterilization of the prepared compost is more effective than that of its components separately [cf. *R.A.M.*, xv, p. 461], and that if sterilized compost is allowed to stand for some length of time, the surface layer to a depth of 5 cm. should be again treated before making up the seed-beds.

Price (W. C.). **Virus concentration in relation to acquired immunity from Tobacco ring spot.**—*Phytopathology*, xxvi, 6, pp. 503–529, 4 figs., 1936.

A fully tabulated account is given of the writer's continued studies

on virus concentration in relation to acquired immunity from tobacco ring spot [*R.A.M.*, xii, p. 120; cf. also ibid., xv, p. 533].

By growing cuttings from recovered plants through a series of ten generations and subsequently testing for ring spot virus, the latter was shown to multiply in such plants. Using the number of primary lesions produced in Black cowpea leaves as a measure of virus concentration, leaves from diseased plants were found to contain on an average from 5 to 10 times as much as recovered foliage. Measurements of virus concentration in partially recovered tobacco leaves affected by ring spot showed that the apparently sound basal portions contain considerably less than the diseased apical parts, while fully recovered foliage contained more virus than the apparently healthy parts of semi-recovered leaves. Heavy inoculations of recovered leaves with the ring spot virus did not appear to increase the content of the latter, which was about five times as high, however, five days after inoculation in healthy leaves of the same age, inoculated simultaneously, as in either the inoculated or untreated recovered foliage. There was significantly more virus in the roots of diseased than in those of recovered plants, while the latter, grown from cuttings through ten generations, contained much less of the infective principle than diseased, and somewhat less than newly recovered plants. Generally speaking, leaves inoculated with undiluted virus contain more of the infective principle than systemically diseased ones, partly on account of the numbers of necrotic lesions in the former, to which the virus content of a given inoculated leaf was shown to be roughly proportional. Considerable variations were observed in the reaction of cowpeas grown under different conditions to inoculation by the ring spot virus.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Service and regulatory announcements, January–March, 1936.—pp. 4–5, 18–26, 33–39, 1936.

Particulars are given of the extension of the Dutch elm disease [*Ceratostomella ulmi*] quarantine (No. 71) [*R.A.M.*, xiv, p. 480 and above, p. 692] as from 31st March, 1936, to 26 new townships in New Jersey and 13 in New York, as well as of amendment No. 1 to the rules and regulations supplemental to notice of quarantine No. 71, defining the regulated areas to which the provisions of the notice in question are applicable.

A reprint, with corrected footnotes and appendices, is given of Quarantine No. 37, relating to nursery stock, plants, and seeds [ibid., ix, p. 688; x, p. 288], incorporating the revised regulations 3 (defining the nursery stock, including seeds, the importation of which necessitates a permit) and 7 (dealing with certification, marking, freedom from sand, soil, or earth, and approved packing material) effective as from 14th January, 1935.

Summaries are given of the plant quarantine import restrictions in force in Palestine, the Grand Duchy of Luxembourg, Sierra Leone, and the Gold Coast. It is also stated that during 1935 the importation of potatoes into Czecho-Slovakia was prohibited except from Italy, Hungary, Spain, Jugo-Slavia, and (by special permit only) the Netherlands, Canada, Germany, Poland, and Austria, with a view to the exclusion of wart disease (*Synchytrium endobioticum*) [ibid., viii, p. 664].

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

Vol. XV DECEMBER 1936

Khudyna (I. P.). Вирусные болезни Табака в СССР. [Virus diseases of Tobacco in the U.S.S.R.]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна (ВИТИМ)* [*The A. I. Mikoyan Pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind. (VITIM)*], Krasnodar, *Publ.* 130, 79 pp., 13 figs., 1936. [English summary.]

After a cursory review of the recent developments in the study of tobacco virus diseases in other countries, a detailed and fully tabulated account is given of investigations, at the Mikoyan Tobacco Research Institute at Krasnodar (north Caucasus) from 1932 to 1935, on those that occur in the tobacco-growing areas of the Crimea and of the Russian south-eastern and Caucasus littoral of the Black Sea.

Tobacco mosaic is practically co-extensive with the crop, and in certain years and localities considerably lowers both the quantity and the quality of yield. Three types of the disease are recognized, closely corresponding to Johnson's severe mosaic types 1 and 2 and mild mosaic type 1 [*R.A.M.*, x, p. 60]. The facts, however, that the symptom expression varied very considerably and that the inoculum could produce the symptoms of any one of the three types, renders it very probable that the disease is really caused by a single virus, which by its pathogenic, physical, and chemical properties appears to be closely related to, if not identical with, Johnson's tobacco virus 1 [ibid., xv, p. 532]. The virus was found experimentally to persist in dry leaves over a period of 4 years, in roots in the soil for 215 days, in processed tobacco for more than a year, in fresh juice treated with 50 per cent. alcohol or nitric acid (1 in 200) for 24 hours, and in decomposing juice for more than 83 days. Special tests showed that while tobacco seed does not in itself carry the mosaic, the dust and vegetable débris with which it is usually mixed often contain infective material, from which the developing seedlings may be infected. In the field infection also frequently occurred when tobacco seedlings or plants were shaded with mats on which, during the winter, mosaic diseased tobacco leaves had been spread after fermentation. Immunity experiments so far have failed to give entirely positive results with any of the varieties of *Nicotiana tabacum* or their hybrids with other species which were used, but in 1934 five lines of a *N. glutinosa* × Dubeck 44 (*N. tabacum*) cross when inoculated with the mosaic only developed local lesions, all

the leaves developing after infection remaining normal, and the mosaic virus being shown to be only present in the inoculated leaves. In the Azoff–Black Sea region isolated tobacco plants were observed to be affected with a peculiar form of mosaic, characterized by scarcely perceptible variegation of the leaves, which were narrowed, especially in the distal half, to almost lanceolate form. This disease has not yet been investigated.

'Pestritza' [speckling], the symptoms of which closely resemble those of the American speck spot [ibid., xii, p. 205], also occurs wherever tobacco is grown. Two forms of the disease are distinguished, namely 'white pestritza', in which the lesions first develop as small chlorotic rings or arcs, inside which the tissues eventually die and become white but do not fall out; and 'brown pestritza', in which the lesions first appear as brown or dark brown necrotic spots, surrounded by a halo; the spots gradually increase in size and may reach up to 2 or 3 mm. in diameter; when fresh the spots are distinctly zonate but later the zonation usually disappears. In number the spots vary from a few to very numerous, involving well over one half of the leaf blade. Of all the transmission methods tested, only successful grafting with diseased scions gave positive results. Infection was demonstrated to be carried by seed from diseased plants, and preliminary tests indicated that the disease may be controlled by dry heating of the seed at 90° to 95° C. for one hour; these high temperatures did not unduly lower the germinability of the seed, but delayed the emergence of the seedlings by 13 to 14 days.

Virescence or female sterility of the tobacco is known locally under the name 'montar', and was shown by Ryjkoff to be caused by the virus of tomato 'stolbur' [ibid., xiv, p. 131; xv, p. 182]. It was experimentally demonstrated that the disease is not transmissible with the expressed juice from diseased plants but can be transmitted by successful grafting with diseased scions or buds; seed occasionally produced by 'montar' tobacco was also shown not to carry the virus. Field observations indicate that the disease is distributed by some insect, and that *Convolvulus arvensis* and *Atropa belladonna* are probably the source of field infections. The leaves of 'montar' plants are thick, coarse to the touch, and brittle; they dry with difficulty, and are greatly predisposed after curing to moulding and rotting, this condition in mixed leaf bales readily spreading to healthy tobacco; for this reason 'montar' leaves should never be packed with the healthy leaves.

The other tobacco virus diseases discussed comprise ring spot [ibid., xv, p. 533], the mild, severe, and coarse types of etch [ibid., xiv, p. 685], streak [ibid., xv, p. 535], and leaf curl or kroepoek [ibid., xv, p. 118]. In addition brief notes are given on four other virus diseases on tobacco, which have not been yet studied.

STANLEY (W. M.). **The inactivation of crystalline Tobacco-mosaic virus protein.**—*Science*, N.S., lxxxiii, 2165, pp. 626–627, 1936.

Treatment of the crystalline tobacco mosaic virus protein [*R.A.M.*, xv, p. 611] with hydrogen peroxide, formaldehyde, nitrous acid, or ultra-violet light has been found to produce inactive native proteins with certain chemical and serological characteristics of the virus protein.

These proteins do not, however, cause mosaic disease or the production of a high molecular weight protein on inoculation into Turkish tobacco, nor does *Nicotiana glutinosa* respond to infection by the development of local lesions. The solutions of the inactive proteins are more opalescent than those of the active type and they tend to denature more readily. On inactivation by nitrous acid the protein possesses a considerably lower laevo-rotation than before treatment. The isoelectric point [ibid., xv, p. 531] of protein inactivated with formaldehyde or nitrous acid is shifted towards the acid side, while that treated with ultra-violet light or hydrogen peroxide remains almost unchanged. Microscopically the crystals of the inactive proteins are indistinguishable from those of the active.

In a typical experiment, inactivation of a 1 per cent. solution of virus protein occurred after five hours' standing at 27° C. with 5 per cent. formaldehyde or hydrogen peroxide at P_H 7 or with 2 per cent. sodium nitrite at P_H 3. The treatments reduced the amino-nitrogen content of the protein by 60, 60, and 99 per cent., respectively. Inactivation of a 0·5 per cent. solution followed eight hours' irradiation with the full light of a laboratory mercury vapour lamp.

The sera of animals injected with virus preparations give a precipitate when mixed with a solution containing only 10^{-5} gm. per c.c. of inactive protein, and the serum of an animal injected with a solution of inactive protein gives a precipitate when mixed with solutions containing only 10^{-5} gm. per c.c. of either active or inactive protein. Caution is therefore indicated in the use of precipitin reactions as an index of virus activity [ibid., xv, p. 242], there being no correlation in the case of inactive protein between precipitin titre and virus activity.

Vigorous treatment of the virus protein involving, for instance, denaturation by means of acids, alkalis, or heat, oxidation with potassium permanganate, chromic acid, or chloramine-T causes the loss not only of virus activity, but also of the characteristic properties of the protein. On the other hand, the use of formaldehyde, hydrogen-peroxide, nitrous acid, or ultra-violet light appears to cause only slight changes in the protein molecule. However, since virus activity is evidently a specific property of the high molecular weight protein, even such minor alterations as result from relatively mild treatments may suffice to cause loss of capacity for infection of susceptible plants.

McDonald (W. J. B.). **Blue mould in Tobacco. Trial of New Zealand seedlings.**—*J. Dep. Agric. Vict.*, xxxiv, 1, pp. 19–21, 32, 2 figs., 1936.

Since no part of Victoria is free from infection by tobacco blue mould [*Peronospora tabacina*: *R.A.M.*, xv, p. 612], it was decided to explore the practicability of raising seedlings in New Zealand, where the disease is unknown, for transhipment to the State. Details are given of experimental consignments, the growth of which so far is stated to be satisfactory.

McDonald (W. J. B.). **Tobacco investigations in Victoria. The efficacy of various fungicides.**—*J. Dep. Agric. Vict.*, xxxiv, 6, pp. 290–291, 315, 1 fig., 1936.

In spraying tests conducted at Shepparton, Victoria, in 1935 by

M. J. Cannon and W. T. Prowd against tobacco blue mould [*Peronospora tabacina*: see preceding and next abstracts] colloidal sulphur 0·1 and 0·4 per cent., and 0·4 per cent. plus malachite green 1 in 10,000, gave no measurable degree of protection. Very little mould developed in beds sprayed two or three times a week with copper preparations, while shirlan XP showed a fungicidal value approximately equal to that of Bordeaux mixture, copper emulsion, and colloidal copper. The fungicides used differed markedly in their effect on the seedlings, those from plots sprayed with shirlan XP taking root best, followed in order of descending merit by those from the untreated plots, the plots sprayed with colloidal copper, and copper emulsion. Bordeaux mixture (2–1–50) seriously injured the seedlings. It is concluded that spray applications twice a week exert a marked degree of control in seasons of light infection.

ANGELL (H. R.), ALLAN (J. M.), & HILL (A. V.). **Downy mildew (blue mould) of Tobacco: its control by benzol and toluol vapours in covered seed beds. II.**—*J. Coun. sci. industr. Res. Aust.*, ix, 2, pp. 97–106, 2 figs., 1936.

The results of further experiments in the control of downy mildew of tobacco [*Peronospora tabacina*: see preceding abstracts] carried out in the spring of 1935 are reported.

At Eurobin, Victoria, twelve shallow square cans, each $4\frac{3}{4}$ by $4\frac{3}{4}$ by $1\frac{1}{2}$ in. deep, were placed in each bed about 5 in. above the soil so as to avoid local injury. Benzol was added to the cans in 18 beds, toluol to 2, and 1 other was left as control. Mildew destroyed all the seedlings in the control bed but no disease was observed in the 20 treated beds which yielded 200,000 seedlings for transplanting. One bed of seedlings, protected by benzol during the night, was repeatedly inoculated but the disease did not appear. In 19 late-sown beds benzol protected the seedlings completely whereas in one untreated bed the disease was widespread.

At Ashford, New South Wales, one bed was treated with benzol, one with toluol, and a third left as a control. The beds had been constructed to conserve the vapours, and when during rainy weather the seed-bed covers were kept in position from 28th to 30th September the benzol vapour severely injured, and the toluol vapour killed, the seedlings. The injured seedlings recovered when the evaporating surface was reduced from $\frac{1}{72}$ to $\frac{1}{144}$ of the seed-bed area. The control bed was then protected by benzol and the toluol bed was resown and used as a control. Downy mildew followed inoculations in the control bed, but in spite of the introduction of infected seedlings and inoculation no disease appeared in the treated beds, from each of which 10,000 healthy seedlings were obtained. In one small seed-bed petrol also gave complete control.

At Canberra similar results were obtained; no disease appeared in the two benzol-protected beds but it developed throughout the control bed. In this experiment the frames were padded to prevent vapour loss and an evaporating surface $\frac{1}{144}$ of seed-bed area was quite adequate.

In seed-beds of the same type the amount of benzol used per bed per day varied from 0·3 galls. at Canberra to 0·58 at Eurobin. The total

quantity used per bed ranged from 18·6 to 44 galls., but the latter figure may be reduced by taking more effective means to prevent evaporation. On account of fungal discoloration the oiled calico covers of the seed beds have to be renewed each season. The efficacy of the method having been established, attention is being directed to reduction of cost and maintenance. Already a simple frame has been used by farmers in South Australia with good results.

AINSWORTH (G. C.). **'Bushy stunt': a virus disease of the Tomato.**—*J. Minist. Agric.*, xliii, 3, pp. 266–269, 4 pl., 1936.

The author gives a detailed description of the symptoms of the new virus disease of tomatoes recorded by K. M. Smith in June, 1935 [*R.A.M.*, xv, p. 263], and for which the name 'bushy stunt' is now proposed. Seedlings are frequently killed outright, and those that survive remain stunted and develop twisted, misshapen leaves. The disease is much more readily transmissible by sap inoculations to seedlings than to larger plants, in which the virus often appears to remain localized in the inoculated leaflets. Roguing out the affected plants and care in pruning are the only control methods recommended.

OGILVIE (L.). **A note on the occurrence of new virus diseases of the Tomato in the Bristol Province.**—*Rep. agric. hort. Res. Sta. Bristol, 1935*, pp. 104–106, [1936].

After briefly describing the symptoms of two virus diseases of tomatoes [bushy stunt: see preceding abstract; and an unnamed disease: Smith's third type described in *R.A.M.*, xv, p. 181] observed for the first time in the vicinity of Bristol in 1935 the author warns growers against mistaking the symptoms for those due to cold, faulty cultivation, drought, excessive watering, mineral deficiencies, and the like. As virus diseases are transmitted from tobacco to tomatoes workers should not be allowed to smoke in the houses and should wash their hands before touching the plants.

WARNER (ELSBETH E.). **Black rot of Tomato, Lycopersicum esculentum, caused by Alternaria sp.**—*Phytopathology*, xxvi, 6, pp. 530–549, 8 figs., 1936.

A comprehensive account is given of the writer's morphological, physiological, and cultural studies of an undetermined species of *Alternaria* responsible for a disease of green and ripe tomatoes (Marglobe, Ponderosa, and Pritchard being the varieties used in these experiments) which may either develop internally and progress outwards or start on the surface and proceed towards the interior. The external lesions, which generally occur at the blossom end, are slightly wrinkled, dark brown, and range from minute pinheads to areas extending completely across the fruit and giving it a flattened aspect. At a later stage the spots develop velvety mats of conidia, and under humid conditions harvested fruits rapidly become covered with a greyish-white mycelium. The internal lesions are dry, leathery, pitch black, and measure 1 to 2 in. in diameter.

The fungus grew best on strained tomato juice agar. The conidiophores are tea-green at maturity and measure 59·2 to 74 by 1·6 to 2·2 μ.

The dark brown conidia, borne in branched chains of 1 to 11, are furnished with 3 to 6 transverse and 1 to 3 longitudinal septa and measure 20·8 to 36 by 3·2 to 9·6 μ, the apical cell or isthmus being 0·2 to 0·5 μ long. Dark brown, thick-walled, circular, quadricellular resting spores, 9·6 to 12·3 μ in diameter, were formed when the medium was almost completely digested. The organism made good growth at 15° to 24° C. but failed to develop to any extent at blood heat or at 10° to 15°.

The results of inoculation experiments with the *Alternaria* indicate that the hyphae enter the fruit either through the stigma of a newly opened flower or through fresh wounds inflicted by insects or mechanical means. Insects may also be instrumental in conveying the spores from diseased to healthy fruits, though wind would seem to be the principal agent of dissemination. Infected fruits drop to the ground and there decay, leaving the conidia and resting spores in the soil. Severe winter conditions kill the former while the latter survive to be carried by the following season's wind-blown dust to reinfect the flowers of the new crop, the disease then being further spread by the conidia developing in the invaded fruits. Evidence was obtained that the fungus is seed-borne; in one test it reduced the incidence of germination from 100 to 22 per cent.

Chadwick (L. C.). **Chlorosis of Pin Oaks.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 669–673, 1936.

A tabulated account is given of recent experiments at the Ohio State University in the control of chlorosis of pin oaks (*Quercus palustris*) [*R.A.M.*, v, p. 597] by spraying with 0·5 or 5 per cent. ferrous sulphate [cf. ibid., xiv, p. 753], injecting the same material in powdered form into two or three holes $\frac{3}{8}$ in. in diameter and 2 to $2\frac{1}{2}$ in. deep in the trunk at the rate of 2 gm. per hole, and applying ferrous sulphate to holes about 15 in. deep evenly distributed in the soil below the branches (about 65 holes per tree 14 in. in diameter), either alone, combined with finely ground sulphur ($\frac{1}{2}$ lb. of each per in. in diameter of the trunk), or these two materials together with a complete 10–6–4 fertilizer (4 lb. per in. in trunk diameter). Of these treatments the soil applications of ferrous sulphate and sulphur gave the most satisfactory results, inducing a return, within three or four months, to an almost or quite normal condition.

Hepting (G. H.). **A destructive disease of the Mimosa tree in the Carolinas.**—*Plant Dis. Reptr*, xx, 11, pp. 177–178, 1936. [Mimeographed.]

A destructive disease of mimosa (*Albizzia julibrissin*) trees recently observed in North and South Carolina has been found to be constantly associated with a *Fusarium* of the *oxysporum* group, possibly identical with *F. albizziae* [*F. merismoides*: *R.A.M.*, xiv, pp. 123, 653], described from the Batum region of Russia by Voronikhin in 1920 as the agent of a similar vascular wilt. Symptoms of the disease include wilting, drooping, shrivelling, and sometimes yellowing of the foliage and a brown discoloration of the sapwood of the trunk, branches, or roots, the last named being probably the main channel of infection. Inoculation experiments to determine the pathogenicity of the fungus are in pro-

gress. Precautionary measures to prevent the spread of infection are briefly indicated.

JOHNSON (H. W.) & EDGERTON (C. W.). **A heart rot of Magnolia caused by Fomes geotropus.**—*Mycologia*, xxviii, 3, pp. 292–295, 1 fig., 1936.

Fomes geotropus [*R.A.M.*, iii, p. 243; ix, p. 421] has been found associated, evidently in a causal capacity, with a destructive greyish-black, green- or reddish-tinted, later brown, rot of *Magnolia grandiflora* heartwood at the Louisiana State University, Baton Rouge. The fungus is believed to enter the tree (apparently a new host) through wounds due to fire or other agencies. Observations made on a tree which fell in December, 1929, showed that termites and other wood-boring insects were abundant in the rotted heartwood and no doubt helped to reduce it to a soft, brown, crumbling mass that gradually fell out, leaving a central cavity tapering upwards from a diameter of 36 in. at the base to a slit-like hollow 4 by 1 in. at 20 ft. above the ground. Just above this point the incipient stages of decay surrounded a shake in the heartwood extending to a height of 38 to 40 ft., the edge of the rotted area being marked by dark zonate lines. Affected trees present a 'stag-head' appearance owing to the sparse leafage of the crowns and the death of the upper branches.

DEARNESS (J.). **Reliquiae kauffmani.** [Material left by Kauffman.]—*Mycologia*, xxviii, 3, pp. 209–213, 1936.

English diagnoses are given of 13 new species of fungi collected by the late C. H. Kauffman, including *Septogloeum parasiticum* Kauff. & Dearn., found in the cortex of elms (*Ulmus americana*) in Michigan, causing a dying-off of affected branchlets. The fungus is characterized by hyaline, oblong, granular, triseptate conidia, 28 to 52 by 12 to 15 μ, exuded in a faintly pinkish pulverulent mass from conidiophores measuring 10 to 45 by 3 μ.

PEACE (T. R.). **Destructive fairy rings, associated with Paxillus giganteus, in young Pine plantations.**—*Forestry*, x, 1, pp. 74–78, 1 pl., 1 diag., 1936.

The occurrence is recorded of 15 fairy rings [*R.A.M.*, xiii, p. 254], 24 to 100 yards in diameter, causing considerable damage in young Scots pine [*Pinus sylvestris*] plantations at Thetford Chase on the borders of Norfolk and Suffolk, where they are due to *Paxillus giganteus*, and one at Heggiesmuir in Fife, where the fungus concerned was identified from a poor specimen as *P. extenuatus* but may possibly be *P. giganteus* also.

In the centre of the rings the trees are healthy. These are surrounded by zones containing (1) small dead trees with many missing, (2) larger dead trees, and (3) an outermost zone of unhealthy and dying trees. A ring of fructifications develops in the autumn between zones (2) and (3). The effect of the fungus on the pines is to cause shedding of the older needles, the formation of short shoots with the needles unusually close together, giving a tufted appearance and later die-back of the branches leading to death. Damage occurs before the mycelial mat has reached

the trees and is either due to the toxic action of the fungus or parasitism. Trenching at Heggiesmuir in 1932 has so far proved successful in stopping the spread of the fungus.

Ray (W. W.). **Pathogenicity and cultural experiments with Caliciopsis pinea.**—*Mycologia*, xxviii, 3, pp. 201–208, 6 figs., 1936.

White pines (*Pinus strobus*) and other conifers, e.g., *P. echinata* and *P. virginiana*, in New York and elsewhere in North America are stated frequently to bear two types of canker associated with *Caliciopsis pinea* [*R.A.M.*, xv, p. 620], one consisting of circular, sharply delimited, reddish-brown, depressed areas up to several inches in diameter and often confluent, sometimes encircling large branches and even the trunk, and the other described by Overholts (*Mycologia*, xxii, p. 235, 1930) as resembling the extreme roughening of the bark caused by the pine woolly aphis [*Chermes pini*]. The latter form of canker appears to be the more injurious.

Cultures of the fungus were obtained from the unicellular, subglobose, light brown ascospores and the resultant mycelium or spore suspensions inserted through slits in the bark of healthy white pines under sterile conditions in the spring of 1934. By the following autumn the typical reddish-brown cankers had developed at the sites of inoculation, and during the spring of 1935 stromata and spermogonia were formed on several; at the time of writing, in August, 1935, however, none of the spine-like stromatic columns destined to contain the asci and spores had been produced. It seems evident from these results that *C. pinea* is the agent of the cankers described, but extensive field studies are necessary to determine the importance of the disease in the nursery and forest.

The fungus grew somewhat better on maize meal than on any of the other media tested, forming small, flask-shaped to globose spermogonia singly or in groups on branched structures, mostly in the depths of the substratum. From the spermogonia the spermatia were exuded in the form of white opaque drops. The buff to dark brown mycelium grew very slowly and frequently presented a zonate aspect. Rhizomorph-like strands were formed in a number of cases by hyphal fusion. Only in two out of many trials was it possible to induce the development of ascospores, partly, no doubt, on account of the slow fruiting habit of the fungus.

Faull (J. H.). **Two Spruce-infecting rusts—Chrysomyxa piperiana and Chrysomyxa chiogenis.**—*J. Arnold Arbor.*, xvii, 2, pp. 109–114, 1936.

Recent successful infection experiments carried out in the Arnold Arboretum with aecidiospores of *Peridermium parksianum* from *Picea sitchensis* [*R.A.M.*, xiii, p. 412] on *Rhododendron macrophyllum* demonstrated that this fungus is the haploid stage of the rust known as *Chrysomyxa piperiana*, a common rust in the uredospore stage on *R. macrophyllum* on the Pacific slope of the north-western United States. Two collections of the teleutospore stage on overwintered rhododendron leaves were made in Oregon and enable the author to present a complete taxonomic description of *C. piperiana*.

Infection experiments with uredospores of *C. chiogenis* from *Chiogenes hispidulà* on *Picea glauca* and *P. mariana* showed that both these species serve as aecidial hosts of the fungus, a full description of which is given.

Peace (T. R.). **Spraying against Meria laricis, the leaf cast disease of Larch.**—*Forestry*, x, 1, pp. 79–82, 1936.

In spraying experiments in 1933 against the leaf cast (*Meria laricis*) [*R.A.M.*, xv, p. 325] of young larch stock in the New Forest, amberene ($1\frac{1}{2}$ per cent.) applied every two or three weeks gave good control, whereas monthly sprayings were not satisfactory. In the Forest of Dean fortnightly applications of amberene ($1\frac{1}{2}$ and 2 per cent.), lime-sulphur, and sulsol (each 1 per cent.) were successful in 1933, and at Newton, Morayshire, fortnightly treatment with sulsol, 1 per cent. or 0·3 per cent. plus 0·05 per cent. special wetting compound, were both extremely satisfactory in 1935. On the basis of these experiments and those previously described the author recommends the use of amberene ($1\frac{1}{2}$ per cent.), sulsol (0·3 per cent. plus wetter), lime-sulphur, and liver of sulphur (0·7 per cent.) against the disease. On no account should spraying be done on hot, sunny days, and lath and other sheltering removed should be replaced immediately after spraying.

Further observations on the disease have shown that the effect of *M. laricis* is to weaken rather than kill the plants and a heavy attack normally entails a larger proportion of very small plants. Spraying results in fewer small plants with a corresponding increase in value varying from 8 to 88 per cent., but when the attack is slight or the growing season favourable the increase in value of the sprayed plants may be negligible.

Mounce (Irene) & Macrae (Ruth). **The behaviour of paired monosporous mycelia of Lenzites saepiaria (Wulf.) Fr., L. trabea (Pers.) Fr., L. thermophila Falck, and Trametes americana Overh.**—*Canad. J. Res.*, xiv, 6, pp. 215–221, 1 pl., 8 diags., 1936.

In view of the similarities existing between *Lenzites sepiaria*, *Trametes americana* (until recently referred to *T. odorata* or *T. protracta* and which, it has been suggested, may be merely a pored form of *L. sepiaria*) [*R.A.M.*, xv, p. 332], and *L. trabea* an attempt was made to apply the clamp connexion criterion for the differentiation of these species, of which the two first named occur on coniferous wood, the third on that of deciduous trees, and all three on constructional timber.

By pairing monospore mycelia of *L. sepiaria* it was found that the fungus is heterothallic and bipolar. *T. americana* shows the same characters. No clamp connexions were formed, however, as the result of 38 pairings of these two species, a result which the authors regard as lending weight to the view that they are distinct. *L. trabea* was likewise found to be heterothallic and formed no clamp connexions with either *L. sepiaria* or *T. americana*.

A comparison of *T. trabea* with *L. thermophila* (also found to be heterothallic and bipolar) [ibid., xi, p. 684; xiii, p. 815] showed them to be completely interfertile, corroborating Cartwright's contention that they represent one species.

ERNEST (ELIZABETH C. M.). **A test for the presence of natural preservative substances in wood.**—*Forestry*, x, 1, pp. 58–64, 1 pl., 1936.

A method is described of determining the presence or absence in a timber of any natural preservative substance. Petri dishes partitioned by a glass slip are filled in one half with damp sawdust and in the other with nutrient agar. A transplant from a culture of a wood-destroying fungus is placed on the agar and the growth recorded. If the wood contains no toxic substance growth is unimpeded; if a water-soluble toxic substance is present it diffuses into the agar and reduces growth near the sawdust; if an insoluble toxic substance is present growth over the sawdust is inhibited.

Results obtained with 15 timbers are tabulated. A number showed no toxic substances to be present, but *Sequoia sempervirens*, *Juniperus procera*, *Taxodium distichum*, *Tectona grandis*, *Thuja plicata*, and other species were toxic to certain of the test fungi used. The last-named permitted growth only on agar away from the sawdust, hot-water extracts of which were also toxic.

WOLF (F. A.). **False mildew of Red Mulberry.**—*Mycologia*, xxviii, 3, pp. 268–277, 3 figs., 1936.

Red mulberries (*Morus rubra*) in North Carolina are liable to attack by a false mildew, first appearing on the leaves in July in the shape of an effuse, white, cobweb-like coating, later turning yellow, and ultimately becoming brown and necrotic.

The mycelium of the causal agent, *Mycosphaerella arachnoidea* sp. nov., emerges from the stomata and extends over the leaf surface, forming a closely adpressed, branched, tangled, hyphal weft, bearing short, knob-like conidiophores arising laterally from the hyphae and producing acrogenously hyaline, septate, blunt-pointed conidia, 40 to 70 by 3·75 to 4·5 μ, belonging to the genus *Cercosporella*. The perithecial stage is initiated just prior to the abscission of the leaves in October, at which time the necrotic areas on the upper surfaces are also densely occupied by dark spermogonial primordia. The spermogonia measure 40 to 65 μ in diameter and are filled with rod-shaped, hyaline spermatia, 4 by 1·25 μ. By the spring the developing perithecia project about half their height above the decaying leaf surface, appearing as black points densely aggregated in patches. The thin-walled, black, papillate perithecia range from 40 to 100 μ in diameter, while the fasciculate asci measure 45 to 54 by 7 to 8·5 μ and contain biseriate, hyaline, bicellular, curved ascospores, 14 to 17 by 3·5 to 4 μ.

The fungus was cultured both from ascospores and conidia and produced on potato agar a rather compact, white to faintly pink growth which remained sterile. Inoculation of healthy leaves with fragments of leaves bearing perithecia resulted in the formation three to four weeks later of a whitish coating of mycelium and conidia of the *Cercosporella* originally observed. The species in question is obviously distinct from the two others previously reported on mulberry, viz., *C. mori* and *C. maculans* [*R.A.M.*, xv, p. 67], and is accordingly designated *C. arachnoidea* nom. nov. *M. arachnoidea* differs in various respects from *Sphaerella morifolia*, *S. mori-albae*, and *M. mori* [ibid., xv, p. 66], but bears some resemblance to *M. moricola* described in 1919 by

Sawada (Descriptive catalogue of the Formosan fungi, I, p. 94) in Japanese. It has, however, so far been impossible to procure a specimen of the latter for comparison, and the name of *M. arachnoidea* has therefore been conferred on the American fungus to avoid further confusion at the present stage.

ROY (H.). **Le pourridié sur les Noyers de l'Isère.** [Walnut decay in the Isère.]—*J. Agric. prat., Paris*, N.S., c, 23, pp. 467–470, 4 figs., 1936.

Attention is drawn to the very serious ravages proceeding in the extensive walnut plantations of the Isère, France, due to a variety of causes, including infection by the honey agaric [*Armillaria mellea*: *R.A.M.*, xi, p. 95]. *Juglans nigra* has been found to be highly resistant to the disease and very encouraging results have been given to date by experiments (still in progress) in its use as a stock for the susceptible local Franquet variety, which produces the much-prized Grenoble walnuts.

OGILVIE (L.) & BRIAN (P. W.). **Progress report on vegetable diseases. VII.**—*Rep. agric. hort. Res. Sta. Bristol, 1935*, pp. 110–117, 1 pl., [1936].

Experimental data [which are tabulated] showed that marked varietal differences exist in the resistance of cabbage lettuce to mosaic [*R.A.M.*, xiv, p. 730]. All the Year Round variety was very severely attacked whereas the related varieties Feltham King and Spring Beauty were little affected. The May Queen and MacHatties Giant types were badly diseased, the Trocadero and Lee's Immense types did not react uniformly, the Arctic types were very severely affected, while Stanstead Park and its related varieties Early Spring and Tremont Winter were highly resistant. Later plantings of winter lettuce were found to be less likely to be severely affected with mosaic than earlier plantings, probably owing to the increasing scarcity of aphids in the winter.

Further experiments in the control of mint (*Mentha villoso-nervata*) rust [*Puccinia menthae*: ibid., xv, p. 745] showed that immersion of the runners in water at either 105°, 110°, or 115° F. for ten minutes was completely effective.

LASKE. **Krankheiten und Schädlinge der Zucker- und Futterrübe.** [Diseases and pests of the Sugar and Fodder Beet.]—*Zbl. Zuckerindustr.*, xliv, 23, pp. 562–565, 12 figs., 1936.

In addition to the important heart and dry rot and crinkle of beets [*R.A.M.*, xv, p. 477], the following diseases deserve special attention in Germany: root rot [*Phoma betae*, *Pythium de Baryanum*, and *Aphanomyces levis*: ibid., xv, p. 550], and leaf spot (*Cercospora beticola*) [ibid., xv, p. 696], which may reduce the sugar content by as much as 4 per cent. Discussing the possibilities of control in the latter case, the writer states that repeated applications of Bordeaux mixture, found effective elsewhere, are uneconomic under German conditions owing to the erratic behaviour of the fungus. It has been observed, however, that the use of borax against heart and dry rot is incidentally valuable in combating eaf spot by protracting the vegetative functions of the plants and so enhancing their resistance to infection. A similar effect is produced by

the late sowing practised in connexion with the trapping of the beet bug [*Zosmenus quadratus*], the vector of crinkle [ibid., xv, p. 549].

DECOUX (L.), VANDERWAEREN (J.), ROLAND (G.), & SIMON (M.). **Considérations spéciales sur la pourriture du cœur de la Betterave sucrière.** [Special considerations on heart rot of Sugar-Beet.]—*Publ. Inst. belge Amélior. Better.*, iv, 3, pp. 67–77, 1936. [Flemish, German, and English summaries.]

Further studies in Belgium on heart rot of sugar-beets [*R.A.M.*, xiv, p. 808; xv, p. 696] showed that it causes losses of up to 30 per cent. of the crop. Incidence was increased by excessive manuring, and also by wide spacing, and was nearly twice as heavy on a variety with poor foliage as on one with dense foliage. The application of 3 per cent. borax solution to the soil at the rate equivalent to 30 kg. borax per hect. as late as 16th September very slightly reduced the spread of the disease, while one made on 26th August (28 kg. per hect. dissolved in 1,400 l. water) reduced subsequent spread from 55 per cent. in the controls to 45 per cent. Borax should not be applied later than the end of August. Even on healthy beets the borax had a favourable effect, increasing both yield and sugar content.

DECOUX (L.), VANDERWAEREN (J.), & ROLAND (G.). **La végétation de la Betterave en Belgique au cours de l'année 1935.** [The growth of the Beetroot in Belgium during the year 1935.]—*Publ. Inst. belge Amélior. Better.*, iv, 3, pp. 79–94, 1 graph, 1936. [Flemish, German, and English summaries.]

The following beet diseases were recorded in Belgium in 1935. In consequence of wet conditions for germination of the seed blackleg [associated with *Pythium de Baryanum*, *Hypochnus* [*Corticium*] *solani* and *Phoma betae*: *R.A.M.*, ix, p. 152; xiii, p. 210; xv, p. 337] was prevalent and some fields had to be replanted. Cercosporiosis [*Cercospora beticola*: ibid., xiii, p. 210, and above, p. 763] and heart rot [see preceding abstract] were less important than in 1934, rust [*Uromyces betae*] occurred in two localities, yellows [ibid., xv, p. 549] was present only to a slight extent, owing probably to the unfavourable weather for the vector, mildew [*Peronospora schachtii*: ibid., xv, p. 193] was noted in a few cases, and a disease [strangle: ibid., xiv, p. 548] new to or very rare in Belgium, though previously recorded from Holland, was observed at Elixem: it was characterized by root 'strangulation' a little below the collar, followed by a withering of the leaves and the death of the plants.

HODGES (F. A.). **Fungi of Sugar Beets.**—*Phytopathology*, xxvi, 6, pp. 550–563, 3 figs., 1 map, 1936.

The writer describes and discusses the results of his studies on the fungal flora of some 5,000 beets grown at Syracuse, New York, and elsewhere in the United States.

The following were the most active and destructive agents of decay in stored beets among the 85 species and varieties investigated: *Phoma betae*, *Rhizoctonia* sp., *Sphaeropsis* sp., *Fusarium dimerum* [*R.A.M.*, xiii, p. 594], *F. orthoceras*, *F. semitectum* var. *majus* [ibid., xiv, p. 472], *F. ventricosum* [*F. argillaceum*: ibid., xiii, p. 261], *F. diversisporum*

[ibid., xiv, pp. 427, 472], *F. arcuosporum* [*F. scirpi* var. *acuminatum*: ibid., xv, p. 654], *F. merismoides* [ibid., xv, p. 643], *F. solani*, *F. chenopodium* [*F. scirpi*: ibid., xv, p. 531], *F. clavatum* [*F. flocciferum*], *F. bullatum* var. *minus* [*F. equiseti* var. *bullatum*: ibid., xiii, p. 594], *F. trichothecioides* [ibid., xv, p. 6], *F.* [*javanicum* var.] *radicicola* [ibid., xiii, p. 397], and *F. scirpi* var. *filiferum*. A considerable amount of rotting was also caused by *Penicillium commune* [ibid., ix, p. 676], *Rhizopus nigricans*, *F. culmorum*, *F. arcuatum* [*F. avenaceum* f. 1], *F. discolor* [*F. sambucinum*: ibid., xv, p. 643], and *F. dimerum* var. *pusillum*. The most extensive penetration of the roots was induced by *F. orthoceras* and *F. dimerum*, and under experimental conditions (beets in damp chambers) the latter caused the heaviest damage. These two fungi were also virulently pathogenic to seedlings of the Menomonee variety in the laboratory (50 to 75 per cent. infection), while in field tests *F. orthoceras* proved to be as actively parasitic as in storage. The type of rot caused by this organism is intermediate between the dry, corky and soft, slimy forms of decay, both resulting from *Phoma betae* infection, and is characterized by a number of cavities, some of which are filled with mycelial growth.

The *Rhizoctonia* sp. was destructive to seedlings, besides producing some decay in stored beets. A species of *Alternaria* occurred as a comparatively mild leaf and petiole infection resulting in slight defoliation of field beets.

BENLLOCH (M.). **Enfermedades de las Judías.** [Bean diseases.]—*Agricultura, Madr.*, viii, pp. 61–62, 1935. [Abs. in *Herb. Abstr.*, vi, 1, p. 60, 1936.]

A bean [*Phaseolus vulgaris*] disease on material submitted for inspection from Burgos was diagnosed as that caused by *Bacterium phaseoli* [*R.A.M.*, xiv, pp. 560, 565]. All remedial measures hitherto tested are stated to have proved ineffectual, but a degree of control may be ensured by late sowing and the use of healthy seed.

ADAM (D. B.). **'Halo blight' in French Beans. A report on measures for its control.**—*J. Dep. Agric. Vict.*, xxxiv, 1, pp. 34–45, 3 figs., 1936.

In studies on the control of halo blight (*Phytomonas* [*Bacterium*] *medicaginis phaseolicola*) [*R.A.M.*, xv, p. 627] of French beans [*Phaseolus vulgaris*] it was found that changes in the date of sowing may lead to considerable variation in the incidence of the disease, owing to differences in the weather conditions experienced immediately after planting. It is considered that beans for seed purposes should not, under Victoria conditions, be planted before 15th November or after Christmas.

Seed disinfection experiments showed that the best results were given by germisan and uspulun, the former being rather better than the latter. The seed was steeped in dilute solutions (0·05 to 0·1 per cent. for germisan) for 12 to 16 hours. Although seed treatment effected a marked reduction in the number of diseased seedlings, weather conditions may cause this initial advantage to be lost during the growth of the crop, with the result that the author does not consider that seed

disinfection offers a means of securing control under Victoria conditions.

Observations in badly diseased fields of Canadian Wonder beans showed individual plants to possess considerable resistance, and the selection and study of these types is thought to offer the best avenue for a solution of the problem of control. The varieties Pale Dun and (to a less extent) Feltham's Prolific also showed resistance.

PUGSLEY (A. T.). **Halo blight of Beans. Varietal resistance tests.**—*J. Dep. Agric. Vict.*, xxxiv, 6, pp. 311–315, 2 figs., 1936.

The failure of growers in Victoria to control halo blight (*Phytomonas* [*Bacterium*] *medicaginis* var. *phaseolicola*) [see preceding abstract] of French beans [*Phaseolus vulgaris*] by roguing diseased plants [*R.A.M.*, xiv, p. 140] is attributed to the local weather conditions, which favour the rapid spread of infection. Seed disinfection experiments were unsuccessful, and laboratory studies showed the presence of the bacterium in the third layer of the seed coat and also completely surrounding the cotyledons, on which small, circular, cream-coloured spots occur, containing large masses of bacteria in the intercellular spaces, and penetrating to a depth of four to five cells.

A strain of the Canadian Wonder variety termed Burnley Selection showed outstanding resistance and gave an average yield of 26 and 29·5 lb. per plot, commercial Canadian Wonder giving only 6·25 lb. per plot. As a result of variety trials in 1935–6 Pale Dun is also classed as very resistant, Star, New Discovery, Black Prince, Black Wonder, Feltham's Prolific, Superlative, and Ne Plus Ultra are moderately resistant, while Surprise, Brown Beauty, and Canadian Wonder are very susceptible. The varieties Tweed Wonder, Magnum Bonum (Flagelot Victoria), and Afrikander (Masterpiece) were not included in the test but were observed on other occasions to be very susceptible.

In an appendix the author does not accept *P.* [*Bact.*] *medicaginis* as the name for the halo-blight organism [ibid., xi, p. 418] and considers that more detailed studies, including serological analysis, would afford a basis for the specific and varietal delimitation of bacteria belonging to this group.

PARKER (M. C.). **Inheritance of resistance to the common mosaic virus in the Bean.**—*J. agric. Res.*, lii, 12, pp. 895–915, 1 fig., 1936.

The [tabulated] results of the experiments discussed in this paper showed that the reaction to common bean (*Phaseolus vulgaris*) mosaic [*R.A.M.*, xv, p. 418] in the progeny of the reciprocal crosses between the resistant Michigan Robust and the susceptible Stringless Green Refugee varieties is to a large extent governed by the maternal parent, but with a marked tendency towards convergence in the younger generations. Thus, the F_1, F_2, F_3 generations of the susceptible (female) $\times$ resistant (male) cross showed 100, 99, and 91 per cent. susceptibility, respectively, while the same progenies of the reciprocal cross showed 82, 56, and 35 per cent. resistance, respectively. Some of the plants resistant in F_2 produced both susceptible and resistant F_3 individuals, while susceptible F_2 hybrids gave rise to some resistant plants in F_3. These results are not explicable on a simple Mendelian basis and suggest

that the immediate reaction of the plant to the mosaic virus is governed by the cytoplasm or some extranuclear inclusion. The convergence of the results from reciprocal crosses in the F_2 and F_3 indicates that the ultimate control is nuclear but that there is a delayed expression of the action of the genes; it must also be assumed that certain genotypes modify the reaction of the cytoplasm more rapidly than others.

The F_1 progenies of crosses between the resistant Corbett Refugee and the susceptible Stringless Green Refugee and the F_1 of the reciprocal crosses were all resistant, but in the F_2 generation 91 per cent. of the Corbett Refugee × Stringless Green Refugee progeny were resistant and 9 per cent. susceptible, while in the reciprocal cross 79 per cent. were resistant and 21 per cent. susceptible. These results, like the foregoing, do not conform to any Mendelian ratio, though when Stringless Green Refugee was used as the female parent the ratio approximated 3 : 1. Crosses between the two resistant Corbett Refugee and Michigan Robust varieties yielded all resistant F_1 plants, but in the F_2 generation there were 7 per cent. susceptibles from Corbett Refugee × Michigan Robust and 9 per cent. susceptibles from the reciprocal cross, a clear evidence that the two varieties differ in their bases for resistance, or at least that they differ in ability to transmit this resistance in crosses with susceptible plants.

Löhnis (Marie P.). **Wat veroorzaakt kwade harten in Erwten?** [What is the cause of marsh spot in Peas?]—*Tijdschr. PlZiekt.*, xlii, 6, pp. 159–167, 1936. [English summary.]

Comparative chemical analyses of pea seeds in Holland having revealed no difference between the boron content of healthy material and that affected by marsh spot [*R.A.M.*, xv, p. 626], the writer conducted similar tests to determine the possible relation of manganese deficiency to the disease. In all seed samples the manganese content was found to be higher in sound than in diseased seeds (0·01 mg. per 2 gm. dry weight as against 0·0075 mg. in the Schokker variety and from 0·0108 to 0·0125 mg. as against 0·0075 mg.—0·01 mg. in small seeds—for Mansholt Plukerwt), suggesting that an important part is played by this element in the health of peas.

Geach (W. L.). **Root rot of grey Peas in Tasmania.**—*J. Coun. sci. industr. Res. Aust.*, ix, 2, pp. 77–87, 1936.

A severe root rot of peas occurs in Tasmania throughout the pea-growing area often reducing the yield so considerably that the crop is unprofitable. The degree of infection is slight at first but increases with subsequent sowings, particularly when these closely follow one another.

Except for a frequent red coloration of the vascular cylinders of the roots the symptoms of the disease agree with those recorded for *Aphanomyces euteiches* [*R.A.M.*, xiv, pp. 151, 286, 425] to which Dr. E. I. McLennan attributed the disease in an unpublished report dated 1927. In cultural studies the Tasmanian organism, which the author regards as probably a strain of *A. euteiches*, differed from the type description in that it formed coils of hyphae somewhat like the hair-spring of a watch at a number of points on the surface of nearly all the media used, especially on prune agar and maize meal agar. Cable-like

strands composed of two or more hyphae twisted about one another developed on the latter medium. Although encysted zoospores were formed in large numbers attempts to induce the abundant production of motile zoospores usually formed by this species were unsuccessful. The addition of peptone to maize meal agar prevented the formation of sexual organs, and sodium nitrate and ammonium sulphate produced a similar effect when used in small quantities, whilst in larger amounts they prevented growth completely. In a comparative test the fungus proved to be more sensitive to sodium nitrate than seven other root-rotting fungi.

Inoculation of the soil, whether sterilized or unsterilized, in pot experiments in the greenhouse and out-of-doors resulted in the reproduction of the disease on peas. In the greenhouse trials the fungus readily infected 12 varieties of peas, subterranean clover (*Trifolium subterraneum*), *Vicia* spp., lucerne, and sweet peas, and was weakly parasitic on barley and oats. Experimental evidence was obtained that the organism persists in the soil for more than two years.

In pot experiments in the greenhouse the addition of urea at the rate of 1, 0·5, and 0·25 gm. per pot reduced the diseased plants from 27 in the control to 1, 3, and 2, respectively, 50 seeds being used in each pot. In another experiment trays of infected soil were treated with urea (3·75 gm.), ammonium sulphate (8 gm.), and sodium nitrate (10·6 gm.), respectively, and the diseased seedlings (from the second sowing of 200 peas per pot) were 87, 58, and 39, respectively, compared with 174 in the control. In further experiments in trays out-of-doors applications of urea gave a similar result while field plots (3 ft. by 3 ft.) treated with urea (at the rate of 1 cwt. per acre), sodium nitrate, and ammonium sulphate (the two last-named at the rate equivalent, as regards nitrogen, to the urea) yielded 139, 184, and 145 gm. of seed, respectively, compared with 75 gm. for the control.

Tisdale (W. B.) & Kelbert (G. A.). **Pink rot of Celery in Florida.**—*Plant. Dis. Reptr*, xx, 8, pp. 134–135, 1936. [Mimeographed.]

In the Sarasota area of Florida pink rot of celery (*Sclerotinia sclerotiorum*) [*R.A.M.*, xiii, p. 356] caused losses estimated at from 50 to 80 per cent. in the current mid-season's planting involving about 300 acres. Celery from these fields also suffered over 50 per cent. losses during transit. This exceptionally severe outbreak is attributed to frost injury in December after the crop was set and the subsequent cold rainy weather. Removal of injured leaves after the frost was said to have lessened the damage.

Neergaard (P.). **Attacks of Alternaria radicina on Celery and Carrot.**—Reprinted from *K. VetHøjsk. Aarrskr., 1936*, 42 pp., 11 figs., 3 graphs, 1936.

The outcome of the writer's investigations on the celery disease caused in Denmark by *Alternaria radicina*, for which the name of 'black mould root rot' is proposed to distinguish it from 'ordinary celery root rot' (*Phoma apiicola*), has already been summarized from another source [*R.A.M.*, xv, p. 275]. *A. radicina* was also found attack-

ing parsley, parsnip, and the roots and seeds of several Danish and foreign varieties of carrot.

A comparative study was made of herbarium specimens of *Macrosporium dauci* (Kühn) Rostrup and an undescribed species labelled by O. Rostrup '*M. daucinum*', of which the former has been said to be identical with *Alternaria brassicae* (Berk.) var. *dauci* (Kühn) Bolle [ibid., iii, p. 506], and the writer's isolation of *A. radicina*, with the result that no essential differences in spore size and shape were found between the Rostrup specimens and *A. radicina*. In three of Rostrup's preparations, as in those of *A. radicina*, the spores were deep brown, ellipsoid, oval, devoid of a rostrum, rounded at both ends, and measured on an average 39 to 48 by 16 to 23 μ, compared with 42 by 17 μ for *A. radicina*, whereas those of *A. brassicae* var. *dauci* are of a more vivid colour, rostrate, and measure 90 to 350 by 14 to 42 μ.

Good control of the black rot of carrot induced by *A. radicina* was obtained by seed treatment for $\frac{1}{2}$ to $1\frac{1}{2}$ hours in 0·25 per cent. germisan, sanagran [ibid., xv, p. 73], or uspulun.

Dearborn (C. H.) & Raleigh (G. J.). **A preliminary note on the control of internal browning of Cauliflower by the use of boron.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 622–623, 1936.

Heavy losses are stated to have been sustained of recent years by growers in the Catskill Mountain district of New York State through a disease of cauliflower characterized by small, brown, concentric, water-soaked areas in the stem, centre, and small branches of the curd, whereby a bitter flavour is imparted both to raw and cooked heads. In severe cases rusty-brown areas also appear on the surface of the curd, and at this stage the trouble is also known locally as brown or red rot. In 24 fields in which borax was applied to the plants at the rate of 1·25 lb. per acre or incorporated at that of 2·5 lb. per acre with a 4–8–7 fertilizer, no superficial browning appeared, while in 22 the plants treated were also free from internal symptoms, which were present only to the extent of 5 per cent. in the borax-treated rows in the other two fields. In 45 per cent. of the experimental fields internal browning occurred in a virulent form in the rows on either side of those treated with borax, while external symptoms were also prevalent in several of the fields in the rows from which borax was omitted.

Greeves (T. N.) & Muskett (A. E.). **A temperature study of Pythium attack on Swede seedlings.**—*Ann. appl. Biol.*, xxiii, 2, pp. 264–270, 1 pl., 1936.

In the course of raising swede seedlings in pots in Belfast, many were observed to be killed before emerging without any subsequent signs of damping-off, and from one seedling a species of *Pythium*, placed by S. F. Ashby in the *P. de Baryanum* group, was isolated. Pot experiments with Ideal and Tipperary swedes showed that when the seeds were germinated and grown at low temperatures (average 5·8° C.) in soil inoculated with the fungus, many of the germinating seeds were killed off in a similar manner. The same held true at medium temperatures (average 10·2°), but the number of seeds killed before emerging

was very considerably reduced. High temperatures (23°), on the other hand, reduced the pre-emergence phase of the disease to a minimum, but favoured damping-off. Disinfection of the seed with an organic mercury compound failed to control the disease. These results are considered to indicate that the trouble could be best kept in check by germinating swede seeds at high temperature until emergence, after which the temperature should be lowered to encourage the development of sturdy seedlings.

MALENÇON (G.). **Une grave maladie des Artichauts au Maroc.** [A serious Artichoke disease in Morocco.]—*Rev. Mycologie*, N.S., i, 3, pp. 165–175, 3 pl., 1936.

Artichokes [*Cynara scolymus*] in French Morocco have for some years been seriously infected by a fungus closely resembling *Ascochyta hortorum*, previously recorded on the same host only from Italy [*R.A.M.*, v, p. 15].

The disease on the flower-heads varies in severity with the age of the plants, the seasonal conditions, and the prevailing humidity. Infection generally begins at the tips of the outermost bracts, and if the weather remains dry the attack is restricted to these parts. Their spotted appearance reduces the market value of the plants, though their edible parts are unimpaired. When dew or rain, however, persists within the flower-heads, these are attacked in the inner and not in the outer bracts, which dry more readily. Infection, not easily visible from the outside, proceeds rapidly from the top of the flower downwards. Oily spots appear on the bracts, which then turn a light-yellowish grey and later show a black, wet rot. Secondary attack by bacteria may develop. The toxins liberated by the fungus can kill host tissues more than 15 mm. in advance of the hyphae. The older affected parts become covered with pycnidia, the spores of which are carried in water farther down the flower-heads, leading finally to the complete destruction of their interior parts. The Vert de Laon variety with its compact flower-head is much more susceptible than the more open Violet d'Alger and varietal differences in bract infection appear to be due merely to morphological factors, since all varieties are equally susceptible to stem infection.

Stem infection does not appear to start at any particular level. A livid, translucent spot appears, gradually turning black and lengthening towards apex and base. The affected tissues become disorganized, soft, and covered with pycnidia. Infection spreads to the leaves along the midrib, on which pycnidia also develop. The blade is largely destroyed, but the shreds that remain also bear fructifications of the fungus. Under favourable conditions, the invasion of the stems is very rapid.

The light brown to nearly black, globular-depressed pycnidia, 150 to 350 μ in diameter, contain uni- or bicellular spores, 6 to 12·5 by 2·25 to 3 μ. In view of the small dimensions of the pycnidia and conidia and the specialization of this form on artichoke (eggplants in Morocco are never infected) the author considers that the fungus is a variety, homologous with *A. lycopersici* [*Didymella lycopersici*: ibid., viii, p. 10], of *A. hortorum*, and names it [with a Latin diagnosis] *A. hortorum* var.

compositarum n. var. It is possible that *A. cynarae* Maffei is identical with the author's fungus.

As artichokes are eaten raw, spraying requires to be effected with great care. The control measures recommended consist in the destruction of all affected plants, surface disinfection of the soil by spraying with Bordeaux mixture before the autumn rains set in, with a second application a fortnight later, and preventive spraying of the young plants with dilute [copper] oxychloride, [Bordeaux] mixture, or ortho-oxyquinoline salts, such as cryptonol [ibid., xiv, p. 552].

SHAW (F. J. F.). **Studies in Indian pulses. The inheritance of morphological characters and of wilt-resistance in Rahar (Cajanus indicus Spreng.).**—*Indian J. agric. Sci.*, vi, 2, pp. 139–187, 3 pl. (1 col.), 1 graph, 1936.

In part II of this paper the author gives a full tabulated account of his investigations during 1929–34 at the Pusa Agricultural Research Institute, India, on the inheritance of resistance of pigeon pea (*Cajanus indicus*) [*C. cajan*] to wilt (*Fusarium vasinfectum*) [*R.A.M.*, xiii, p. 346]. The F_2 populations of reciprocal crosses between the Pusa types 5 (susceptible) and 80 (resistant) were grown in infected fields and the percentage loss due to wilt suggested that inheritance of resistance may be found in a 9 : 7 or 27 : 37 ratio, indicating that two or three pairs of factors are concerned, resistance being dominant. No linkage was found between the inheritance of wilt resistance and that of any of the morphological characters studied. Further proof of the absence of linkage and the dependence of resistance on multiple factors was afforded by the F_3 generation. Selected families from the F_3 have been carried up to the F_6 generation and phenotypes possessing the quality of wilt resistance and most of the morphological characters of the susceptible parent have been isolated. Morphologically identical hybrids showed great variation in their reaction to wilt disease from almost complete resistance to complete susceptibility.

MUNDKUR (B. B.). **Influence of temperature and maturity on the incidence of Sann-Hemp and Pigeon Pea wilt at Pusa.**—*Indian J. agric. Sci.*, v, 5, pp. 609–618, 2 graphs, 1935. [Received 1936.]

Records made weekly of the deaths of sann-hemp (*Crotalaria juncea*) and pigeon pea (*Cajanus indicus*) [*C. cajan*] plants from *Fusarium vasinfectum* [*R.A.M.*, xv, p. 278 and preceding abstract] in experimental plots at Pusa and of the mean soil temperature showed that high soil temperatures, between 28° and 33° C., favoured the disease in sann-hemp, whereas low soil temperatures, between 17° and 29° favoured the disease in the pigeon pea. In addition to soil temperatures, maturity of the plants exercised an influence on their susceptibility to the fungus, most plants of the sann-hemp dying in the earlier part of the season and most of pigeon pea in the later. Statistical analysis of the data obtained showed that multiple coefficients of correlation between soil temperatures, maturity, and wilt resistance were significant and revealed high association between these variables. The values of partial coefficient of correlation between wilt incidence and soil temperature, eliminating the effect of maturity, or between wilt incidence and

maturity, eliminating the effect of soil temperature, were not significant, showing that the influence of soil temperatures and maturity on the incidence of wilt is not due to either of these acting independently but is a combined influence.

Wilson (R. D.). **A bacterial disease of Snake Beans.**—*J. Proc. Roy. Soc. N.S.W.*, lxix, pp. 215–223, 1 pl., 1936.

In January 1935, snake or asparagus beans (*Vigna sesquipedalis*) near Mudgee, New South Wales, were observed to be affected by a bacterial disease causing a reddish-brown spotting of the leaves, petioles, stems, and pods. The lesions were frequently encircled by a narrow zone of yellowish-green tissue, and the centres shrivelled and fell out. On the under sides of the leaves a blackening of the veins was sometimes observed. These symptoms agree closely with those of a similar disease of cowpea due to *Bacterium vignae* [*R.A.M.*, v, p. 401; vi, p. 276; cf. also ix, p. 695], which is believed to have been the agent of a bacterial disturbance of the same host observed at Glen Innes, New South Wales, in 1932, as recorded by Noble et al. [ibid., xiv, p. 618].

Comparative studies of the bacterium isolated from *V. sesquipedalis* (the pathogenicity of which was demonstrated by inoculation experiments), *Bact. vignae* (from California), and *Bact.* [*Pseudomonas*] *syringae* [ibid., xv, p. 678] (from lilac in New York and from citrus in Victoria) were carried out. Culturally and morphologically all three organisms were identical except in raffinose fermentation, and the differences between them in respect of pathogenicity to various plants are not considered to justify specific separation. The causal organism of snake bean leaf spot is therefore referred to *P. syringae*.

A 'rough' strain of the *V. sesquipedalis* pathogen arose as a mutant in beef extract and potato agar cultures. It differed from the normal smooth strain in its slight motility, apparent absence of flagella, and considerably lower degree of virulence.

No species of *Vigna* or other cultivated legume having been grown on the land occupied by the infested crop for some four or five years, there was reason to believe the disease to be carried on the seed imported from the United States, and this supposition was partly confirmed by greenhouse experiments with seed from the affected crop, which produced plants with the typical lesions yielding the organism described above.

Herschler (A.). **Ernährungsstörungen an Reben durch Bodenverhältnisse mit besonderer Berücksichtigung von Kalimangelschäden.** [Nutritional disturbances in Vines due to soil conditions, with special reference to potassium deficiency injuries.]—*Ernähr. Pfl.*, xxxii, 11–12, pp. 197–204, 1 col. pl., 1 fig., 1936. [English and Spanish summaries on p. 216.]

On 'vine-sick' soils, in the Moselle, Saar, and Ruwer valleys, especially those of sandy composition with sticky subsoils of the lower and middle diluvial terraces, the foliage showed patchy discolorations. Such types of soil were found on analysis to be more or less acid and deficient in one or more plant foods. Lack of phosphoric acid was

characterized by punctiform, brown, shrivelled areas spreading from the leaf margins inwards and often covering a quarter of the lamina by the end of July. Affected leaves generally drooped and fell several weeks before the normal time, and the stocks made poor growth and gave low yields. Magnesium deficiency may possibly have been responsible for a conspicuous rusty to brownish-black mottling of the foliage, scorching of the margins, marked curtailment and branching of the nodes, and reductions of yield amounting to 50 per cent. or more, but the exact nature of these disturbances has not yet been elucidated. Potash shortage is characterized by prominent mosaic-like lesions starting in the intercostal areas and rapidly extending almost over the whole leaf. The grapes are still small and hard when healthy bunches are approaching maturity. The application of muriate of potash at the rate of 180 lb. per 1,200 sq. yds. led to the disappearance of these symptoms in one to three years.

MERJANIAN (A. S.) & LIPETZKAYA (Mme A. D.). Влияние на продолжительность инкубационного периода болезни Виноградной лозы мильдью постоянных температур и переменных. [Effect of constant and fluctuating temperatures on the length of the incubation period of downy mildew of the Vine.]—*Sovetsk. Bot., 1936*, 3, pp. 68–77, 1 graph, 1936.

The authors describe the results of their controlled experiments and field observations [some details of which are given] on the incubation periods of vine mildew (*Plasmopara viticola*). Under the more or less constant temperature conditions which usually prevail in vine-growing areas during the spring the duration of these periods may be fairly accurately determined by means of Müller's curve [*R.A.M.*, xv, p. 702]. In regions, however, where during spring the day and night temperatures are subject to sudden and sharp fluctuations the incubation period may be considerably shortened (by as much as 72 hours); this occurs when night temperatures are higher and day temperatures are lower than normal for the season, the nocturnal rises being more important in this regard than the diurnal fall in temperature. Abnormally cold nights and abnormally warm days, on the other hand, did not appear to affect the length of the incubation period, which is considered to last from the actual penetration of the host tissues by the germ-tubes produced by the zoospores to the appearance of the conidial efflorescence, coinciding approximately, under unfavourable conditions of air humidity, with the formation of oily spots on the leaves. It was further shown that a closer estimation of the length of the incubation period may be obtained by a method based on the following considerations. It was experimentally established that the duration of the incubation period is determined by the sum total of degrees of 'active' or 'effective' average daily temperatures (i.e. the temperature above the 'critical' [minimum] points, calculated from Blunck's formula, below which the germination of the zoospores inside the stomata and the growth of the intramatrical hyphae are completely suppressed) prevailing during the incubation period. This sum total was shown to range, within the limits of 13° to 24° C. (the average temperatures of Müller's curve), from 58·9° to 62·6°, giving a working average of 61°.

The actual length of the incubation period appears to be obtained by dividing 61° by the average daily 'active' temperature, and the latter is calculated by subtracting from the actual temperature reading the 'critical' temperature for the given set of nocturnal and diurnal temperatures. A graduated table is appended showing the 'critical' temperatures within 13° and 24° of night and day temperatures.

It is thought that the shortening of the incubation period under the influence of higher night and lower day temperatures may be due to a physiological effect on the parasitic organism; a partial confirmation of this hypothesis was found in the facts that the incubation of the mildew was considerably lengthened by subjecting the developing spots to ether vapour, and that the conidia from such spots also took a longer time to form fresh conidia on the untreated host under normal conditions.

PETRI (L.). **Rassegna dei casi fitopatologici osservati nel 1935.** [Review of phytopathological records noted in 1935.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 1, pp. 1–25, 6 figs., 1936.

During the period under review [cf. *R.A.M.*, xiv, p. 679] wheat grown over a very large area in Friuli showed a serious wilt, the symptoms of which resembled those due to foot rot, associated only with *Leptosphaeria herpotrichoides* [ibid., xv, p. 709] and a *Pythium*; the leaves bore *Septoria graminum* [ibid., xi, p. 709]. Owing to the very low temperatures prevailing in the spring attacks by *Puccinia triticina* and *P. graminis* were limited, though the weather conditions strongly favoured infection by *P. glumarum*. *Cephalosporium sacchari* [ibid., xi, pp. 203, 562] was present saprophytically on discoloured maize tissues.

Grapes were infected by *Diplodia uvicola* Spesch., which is reported in the Caucasus to be a contributing factor in the production of a false black rot of the fruit clusters. Vine roots were severely rotted by *Rosellinia necatrix*, and in one vineyard by *Armillaria mellea*.

Olive fruits were attacked by *Sphaeropsis dalmatica* [ibid., xiv, p. 706] and the roots by *R. necatrix*. *S. malorum* Peck [*Physalospora obtusa*: ibid., xv, p. 726] occurred on pear branches. Young pears grafted on quince showed abundant formation of adventitious roots under the graft site; the condition is attributed to infection by *Phytomonas* [*Bacterium*] *rhizogenes* [ibid., xv, p. 663]. Apricots were affected by leptonecrosis [ibid., xiv, p. 800] and fig branches by *Bact. fici* [ibid., xii, p. 746]. Walnut collar and root rot, due principally to *Phytophthora cambivora* or a closely allied organism [ibid., xiv, p. 680], became increasingly prevalent.

Owing to the cold, dry winter and hot, dry summer, there was not much extension of 'mal secco' disease of lemons [*Deuterophoma tracheiphila*: ibid., xv, p. 575] in 1935. Green lemons sent from Acireale to Trieste showed leather-coloured depressed areas on the epicarp and reaching the mesocarp, associated with *Phomopsis cytosporella* [ibid., xii, p. 746]. Lemon fruits were affected by *Septoria citri* [ibid., xiv, p. 816]. Orange root rot (*Phytophthora citrophthora*) [ibid., xv, p. 213] was widespread and serious.

Young nursery stock of *Acer platanoides* was infected by a *Fusarium*

of the *lateritium* group; the tissues in the region of the collar broke down and the wood showed a blue discoloration. *Rhododendron ferrugineum* plants in gardens near Rome were affected by anthracnose (*Gloeosporium rhododendri* Br. & Cav.). Oleander (*Nerium oleander*) leaves affected by wilt due to *S. oleandrina* were received from two localities. A wilt of mulberry shoots caused by *F. lateritium* occurred in northern Italy. In March and April, *Lupinus luteus* growing near Rome showed the wilt due to *Ceratophorum setosum* [ibid., xiii, p. 166].

Diseases recorded on market-garden produce include spinach anthracnose (*Colletotrichum spinaciae*), *F. semitectum* [ibid., xiv, p. 472] on cucumber, and *Puccinia endiviae* and *Bremia lactucae* on endive [ibid., v, p. 275; ix, p. 224]. Tomato seedlings developed a rapid wilt as a result of infection of the collar by *P. parasitica*, the mycelium spreading up one-third of the stems. In four provinces tomatoes were severely damaged by *F. bulbigenum*. Tomato fruits showed round, yellow or greenish-yellow spots resembling those of the English form of spotted wilt [ibid., xv, pp. 324, 404], a yellow leaf-spotting also being present.

Agaricus [*Psalliota*] *campestris* was damaged by *Verticillium malthousei* [ibid., xiii, p. 287]; improved ventilation was recommended as a control measure.

Marchal (É.). **Observations et recherches effectuées à la Station de Phytopathologie de l'État pendant l'année 1935.** [Observations and researches carried out at the State Phytopathological Station during the year 1935.]—*Bull. Inst. agron. Gembloux*, v, 2, pp. 105–111, 1936. [Flemish, German, and English summaries.]

This report [cf. *R.A.M.*, xiv, p. 679] contains, *inter alia*, the following items of phytopathological interest. Wheat in Belgium became affected in March with the foot rot due to *Cercosporella herpotrichoides* [see preceding abstract], frequently in association with a *Fusarium*. The foot rot due to *Ophiobolus graminis* was prevalent on compacted soils and where couch grass [*Agropyron repens*] was present. In some localities *Erysiphe graminis* and *Septoria tritici* [ibid., xv, p. 558] were exceptionally widespread on wheat.

Potato scab (*Actinomyces scabies*) was unusually common, owing to dry, hot weather in July and August. Several new centres of infection by *Synchytrium endobioticum* [ibid., xv, p. 601] were noted. Industrie potatoes, especially in the Ardennes, were affected by a condition referred to as physiological or pseudo-leaf roll, the top leaves rolling up, but the bottom ones not being brittle as in true leaf roll; the discoloration typical of the latter disease was also absent. The Industrie variety is very susceptible to the condition in hot, dry summers. A conspicuous interveinal mosaic observed on *Datura stramonium* growing in the Botanical Garden at Gembloux was found to be due to potato virus X [ibid., xv, p. 738].

In several localities fodder beets became affected during the autumn by a premature yellowing of the leaves and a dry, black rot in the roots. Cultures from affected material gave *F. conglutinans* var. *betae* [ibid., xiv, p. 549], sometimes in association with *Phoma betae*. Inoculations of growing beets with the former organism gave rise to the same symptoms.

Flax was widely and severely affected by *P. linicola* [ibid., viii, p. 106]. Lucerne at Pondrôme was infected by *Rhizoctonia violacea* [*Helicobasidium purpureum*: ibid., x, pp. 670, 800; xv, p. 191] and *Urophlyctis alfalfae* [ibid., xii, p. 177], the latter being a new record for Belgium. *Gloeosporium caulivorum* [*Kabatiella caulivora*: ibid., xv, p. 158] caused a moderate amount of damage to clover. Beans [*Phaseolus vulgaris*] were infected by *Phyllosticta phaseolina* [ibid., ix, p. 274], and carnation rust (*Puccinia arenariae*) [ibid., xi, p. 624] occurred frequently.

Güssow (H. T.). **Progress report of the Dominion Botanist for the years 1931 to 1934, inclusive.**—Canada Dep. Agric., Div. Bot., 86 pp., 1 fig., 1935. [Received July, 1936.]

The issue of this report restores the continuity of the series which has been interrupted for from 1931 to 1934, inclusive. Many of the items noticed have since been published in full elsewhere, reference to the published papers being cited in each instance. Apart from these, the following are of special interest.

F. J. Greaney and J. E. Machacek found that the least amount of root rot of wheat (*Fusarium culmorum* [*R.A.M.*, xv, p. 640] and *Helminthosporium sativum* [ibid., xv, p. 639]) occurred in plots receiving a complete fertilizer where growth was most vigorous. Potassium and phosphorus singly reduced leaf rust [*Puccinia triticina*] while nitrogen was without effect. Nitrogen increased susceptibility to stem rust [*P. graminis*].

Hollyhock rust [*P. malvacearum*: ibid., xiv, p. 38] was found by R. R. Hurst to be effectively controlled in 1932 and 1934 by Bordeaux mixture (4–4–40) plus casein. Lime-sulphur (1 in 60) gave good control but caused some leaf injury while weaker strengths were valueless. Sulphur dust was injurious and inefficacious. Spray applications should be made at intervals of ten days during the growing season.

D. J. MacLeod reports that asters [*Callistephus chinensis*] remained free from yellows when protected by cotton-covered cages; a serious and widespread condition resembling yellows was found in carrots and salsify in New Brunswick in 1933. R. R. Hurst records aster yellows as destructive in Prince Edward Island where the disease is suspected of overwintering in *Leontodon autumnalis*.

An apparently new disease of zinnia is attributed by G. E. Woolliams to a species of *Fusarium* which inoculation experiments showed to be pathogenic at soil temperatures above 30° C. The disease appears when the plants are coming into bloom and is characterized by a sudden wilting of the leaves on a part or the whole of the plant.

In studies on apple scab [*Venturia inaequalis*] J. F. Hockey found that expressed juices of resistant varieties of apples are more toxic to spores of the fungus than juices of susceptible varieties.

Spindle tuber of potatoes [ibid., xv, pp. 247, 460], an important problem in Prince Edward Island, was found by R. R. Hurst in greenhouse tests to be transmitted by rubbing the cut surface of diseased sets against the cut surface of a healthy tuber. The results indicated that this agency is responsible for a great measure of the dissemination of the disease and in field tests in 1933 and 1934, the effectiveness of contaminated sets in spreading spindle tuber was demonstrated, infection

ranging from 1·8 to 11·1 per cent. in plants from sets which after cutting had been shaken up in a basket with freshly cut diseased tubers. Transmission by the cutting knife was effected in 34 per cent. of the sets tested in the greenhouse and 19 per cent. of those grown in the field.

Light soil covering was ascertained by R. R. Hurst to be conducive to the development of late blight [*Phytophthora infestans*]. During October 1932, a survey was made of 32 fields in which an average of 5 per cent. of the plants produced tubers showing through the ground and all of these tubers had contracted blight.

By following a crop rotation of two years in onions, one year in maize, and three in lucerne the amount of infection by *Fusarium* bulb rot of onions [ibid., ix, p. 434; xii, p. 613; xiv, p. 150] was observed by G. E. Woolliams to fall from approximately 40 per cent. to 1 per cent.

In continuation of his work on eggplant wilt (*Verticillium dahliae*) J. K. Richardson found that the application of cyanamide to the soil promises to reduce the amount of disease to a considerable extent. The same author has succeeded in reproducing black heart of celery artificially by subjecting the plants to conditions of abnormal temperature and humidity.

In September, 1933, eggplant fruits were observed by J. K. Richardson with rather large lesions, $\frac{1}{2}$ to $1\frac{1}{2}$ in. in diameter, considerably depressed and covered to within $\frac{1}{4}$ in. of their margins with a mass of spores of a species of *Alternaria*. The affected tissues were leathery, and extended up to $\frac{3}{4}$ in. inwards. Successful artificial inoculations have been made both in the field and greenhouse.

SUNDARARAMAN (S.). **Administration Report of the Government Mycologist, Madras, for the year 1935–36 (detailed report).**—13 pp., 1936.

In a test carried out at Coimbatore on the control of foot rot of rice caused by *Fusarium moniliforme* [*Gibberella moniliformis*: *R.A.M.*, xv, p. 740] treatment of artificially infected seed with copper sulphate (1 per cent. for 15 minutes), the same followed by addition of lime water, Bordeaux mixture (2 per cent. for 30 minutes), ceresan (1 gm. per lb.), and control lots gave 4·35, 5·66, 11·51, 1·27, and 29·67 per cent. diseased plants, respectively.

In resistance trials the sugar-cane varieties Co. 326, 229, 335, 355, 356, 508, 413, and P.O.J. 2878 remained unaffected by mosaic, and Co. 411, 412, and 353 showed a high degree of resistance. Inoculations from mosaic recovered (or masked) Co. 361 on healthy Co. 361 and 213 did not cause infection and a similar result was obtained on plants from recovered setts inoculated with virus from diseased Co. 213 cane; it is thought that the plants may have acquired immunity as a result of their previous infection. Attempts to transmit mosaic by seed has so far proved unsuccessful.

Experimental evidence showed that the cheapest and most effective method of seed-bed disinfection against tobacco black shank (*Phytophthora parasitica nicotianae*) [ibid., xv, p. 686] consisted in burning trash on the surface. Silver nitrate solution 1 in 1,000 proved to be the most efficacious seed disinfectant, and spraying about three times with 1 per cent. Bordeaux mixture gave satisfactory protection of seedlings

and transplants. The same methods were equally effective against the damping-off stage.

Macrophomina phaseoli [ibid., xv, p. 705] was isolated from wilted wild horsegram [*Dolichos biflorus*] and was proved to be a virulent parasite on this host in the seedling stage. The same strain was found to infect French bean [*Phaseolus vulgaris*] and black gram [*P. mungo*] but not cowpea [*Vigna unguiculata*], gingelly [*Sesamum orientale*], or Karunganni cotton. Inoculations of horsegram made one, two, and four weeks after sowing gave 100 per cent. infection in the first series and about 50 per cent. in each of the other two. The roots, collar, cotyledonary node, shoots, and leaflets were all equally susceptible, the optimum temperature of infectivity being about 28° C. Numerous pycnidia were present on horsegram stems in nature.

A yellowing of cholam [*Sorghum vulgare*] was proved to be due to a virus transmitted by the insect *Pundalaya simplicia*.

Encouraging results against severe citrus foliocellosis [mottle leaf: ibid., xv, p. 714] were given by spraying with zinc sulphate and hydrated lime (10–5–100). Satisfactory control of fig rust (*Uredo* [*Cerotelium*] *fici*) [ibid., xiv, p. 560] was given by dusting with 300-mesh sulphur. Spraying trials against vine mildew [*Plasmopara viticola*] showed that the addition to Bordeaux mixture of groundnut oil, coconut oil, and neem [*Melia azadirachta*] oil reduced infection to 5·5, 6·5, and 8 per cent., respectively, as against 31 per cent. for Bordeaux mixture with resin and soda. The oils were, in addition, cheaper than resin-soda.

DEIGHTON (F. C.). **Mycological work.**—*Rep. Dep. Agric. S. Leone, 1935*, pp. 22–26, 1936.

This report [cf. *R.A.M.*, xv, p. 343] contains, *inter alia*, the following items of phytopathological interest. In August, 1935, Cavendish bananas [*Musa cavendishii*] on both moist and dry soils at Newton, Sierra Leone, showed bacterial wilt (*Bacterium solanacearum*) [ibid., xiii, p. 788]. *Marasmius stenophyllus* [ibid., xv, p. 165] was recorded for the first time on Cavendish bananas at Freetown. Seedling French beans [*Phaseolus vulgaris*] were affected by a wilt caused by a *Pythium* near *P. myriotylum* [ibid., xiii, p. 599; xiv, p. 473]; the fungus was vigorously pathogenic to unwounded French bean seedlings in the laboratory. *P. coccineus* seedlings were killed by an organism closely resembling *Macrophomina phaseoli* [see preceding abstract]; this species was identified with certainty on old *P. vulgaris* plants in a neighbouring bed. A rot of *Canavalia ensiformis* seedlings just above or below the cotyledons was associated with a *Fusarium* which in culture gave perithecia of *Neocomospora vasinfecta* [ibid., xiv, p. 327]. Rust (*Puccinia penniseti*) [ibid., vii, pp. 231, 712] was newly recorded on *Pennisetum leonis*. Infection was limited to a few leaves and little damage was done.

Citrus scab [*Elsinoe fawcetti*: ibid., xv, p. 575] was present at Njala on 49 per cent. of the total fruit crop, and in addition, some 11,500 young fruits, or about 14 per cent. of the crop, were shed in July, nearly all being badly scabbed. Foster [grapefruit] trees were much more resistant than Marsh. Debuttoning immediately after colouring reduced stem-end rot (*Diplodia*) [?*natalensis*: ibid., xv, p. 495] in

grapefruits by over 75 per cent., the number of rotted fruits out of nearly 9,000 debuttoned grapefruits averaging well under 1 per cent. A few further cases of psorosis [ibid., xv, pp. 343, 574] appeared among late Valencia and Washington Navel oranges; the affected trees were uprooted and burnt.

Gossypium hirsutum and *G. peruvianum* were affected by *Cerotelium gossypii* [*C. desmium*: ibid., xiv, p. 629]. The leaves of *Hibiscus sabdariffa* bore the aecidia of *Aecidium garckeanum* P. Henn., chiefly on the under surfaces; the affected plants were stunted and pale. The fungus was also recorded on the wild *H. surrattensis*. *Myrothecium roridum* [ibid., xiv, p. 428] caused leaf spot of *H. esculentus*, *Luffa acutangula*, *Trichosanthes anguina*, and *Corchorus olitorius*, on none of which was any considerable harm done.

Rice seedlings, especially G.E.B. 24 and Co. 7, were severely attacked by *Piricularia oryzae* [ibid., xv, p. 740], the former variety in nurseries all over the Scarcies; later sowings (made in the wetter period of July and early August instead of in June) escaped severe infection. Ear infection appeared to be rare. *Nigrospora oryzae* was present on the leaves of rice seedlings [ibid., xiii, p. 653], but caused only negligible damage.

A small-sclerotial form of *Corticium solani* was common on ginger [ibid., xii, p. 77] at Njala and elsewhere, being associated with white spots on the leaves, and causing the above-ground parts of the plants to die prematurely.

Minor records included *Cercospora henningsii* on Ceara rubber [*Manihot glaziovii*], *C. stizolobii* on wild *Mucuna pruriens* and cultivated Bengal bean (*Stizolobium aterrimum*), *Choanephora* sp., attacking flowers of *Crotalaria retusa*, and causing a die-back from the seat of infection, *Phytophthora parasitica* in papaw stems, and *Sphaerostilbe repens* in papaw roots, causing wilt.

New records for Sierra Leone were *Cercospora citrullina* [ibid., x, p. 771] on *Citrullus vulgaris*, *Cercosporina ricinella* on *Ricinus communis* [ibid., xii, p. 247], *Septoriella philippinensis* on *Saccharum spontaneum* var. *aegypticum*, *Empusa apiculata* on flies, (?) *E. grylli* [ibid., xv, p. 499] on termites, (?) *Entomophthora aphidis* [ibid., xii, p. 683] on *Aphis medicaginis*, and *Gibellula aranearum* on spiders [ibid., xi, pp. 299, 573].

Virus diseases were recorded for the first time on *Phaseolus lunatus* (rugose and mosaic forms), *Canavalia ensiformis* (mosaic), and yellow yam [*Dioscorea* sp.] (mosaic).

LEACH (R.). **Report of the Plant Pathologist.**—*Rep. Dep. Agric. Nyasald, 1935*, pp. 26–28, 1936.

The following items occur in this report [cf. *R.A.M.*, xiv, p. 561]. Three different [unnamed] fungi were isolated from tea branch cankers when these became conspicuous in July, after pruning in May. In inoculation experiments with these fungi many more branches were cankered than had been inoculated; all the bushes heavily pruned immediately before inoculation were badly cankered, those heavily pruned but with three rim lungs left were affected on only a few pruned branches, those lightly pruned were slightly affected, and, finally, those unpruned but inoculated remained healthy. Sections from discoloured

parts of the inoculated bushes yielded no organisms in culture and it is concluded that this form of canker was due to sun scorch of the branches, which had been growing under heavy shade, with minimum ventilation, and hence had developed a comparatively delicate bark. Fungi enter as secondary invaders but only develop until the new shoots grow. It is suggested that the prunings should be left on top of the bushes until the new shoots have grown sufficiently to provide the necessary shade.

Another manifestation of scorching in biennially pruned tea bushes was characterized by a die-back of a large proportion of the central branches. The affected branches showed a clearly defined scorch ring at ground-level.

The spread of *Armillaria* [*mellea*: ibid., xiv, p. 14] root disease in tea is slow in the absence of *Gliricidia maculata* [*G. sepium*], the loppings of which are used as a green manure in some old tea gardens, but when this host becomes infected, the fungus travels freely along the lateral roots, which may cover an area containing 50 tea bushes. The use of *G. sepium* is, therefore, not recommended.

A tobacco leaf spot was caused by *Pleosphaerulina*, possibly *P. argentinensis* Speg.

The causal organism of the coffee disease previously reported [ibid., xiv, p. 561] as resembling one recorded by Storey from East Africa was identified at the Imperial Mycological Institute as *Fusarium lateritium* [var. *longum*].

Borg (P.). **Report of the Plant Pathologist.**—*Rep. Insp. Agric. Malta, 1934–35*, pp. liii–lxi, 1936.

In this report [cf. *R.A.M.*, xiv, p. 618] it is stated that during the period under review 17 citrus trees and 698 pear trees were affected by root rot (*Armillaria mellea*) [loc. cit., and preceding abstract] in Malta. Following a spell of very moist, warm weather in November and December, *Penicillium italicum* developed with extraordinary virulence on all citrus fruits, causing a high percentage of the crop to rot early in the season. Sea spray caused damage to potatoes even in the central parts of Malta; and following heavy rain *Phytophthora infestans* destroyed over one-third of the winter crop. A survey of rose gardens showed over 5,000 bushes to be badly affected by black spot (*Actinonema* [*Diplocarpon*] *rosae*) [ibid., xv, p. 723]. Plots of fenugreek [*Trigonella foenum-graecum*] grown for experimental purposes were severely infected by *Fusarium oxysporum*.

Plant Pathology.—*Rep. Fla agric. Exp. Sta., 1934–35*, pp. 85–95, 4 figs., [1936].

The following items may be noticed from this report [cf. *R.A.M.*, xiv, pp. 563, 564]. Observations by A. N. Brooks and R. C. Nolen showed that in many cases the growth failure or poor conditions of strawberry plants was due to soil reaction, the best reaction under greenhouse conditions being approximately P_H 5·5. Many local growers have profited greatly by correcting their soil acidity before setting their plants. 'Black root' [ibid., xiv, p. 348] was most pronounced in those soils where the P_H value was unsuited to strawberries. Both weakened and healthy plants were killed by a *Diplodia* and two species of bacteria.

A. H. Eddins observed that infection by *Sclerotinia sclerotiorum* of white (Irish) potatoes was epidemic in a few fields planted in December, but dry weather prevented its occurrence in later plantings [cf. ibid., xv, p. 768]. The Katahdin and Bliss Triumph varieties showed outstanding resistance to *Rhizoctonia* injury [*Corticium solani*: ibid., xv, p. 602], as compared with Spaulding Rose and Green Mountain. Seedling stem infection was reduced by planting quickly germinating seed and also by treating the soil with formaldehyde dust.

W. B. Tisdale and S. Hawkins state that warm, dry weather prevented the development of *Phoma destructiva* on the spring tomato crop [ibid., xv, p. 537], and that under these conditions applications of Bordeaux mixture 4–4–50 and of bentonite Bordeaux mixture reduced the yields of marketable fruit, apparently owing to increased transpiration.

A. N. Brooks reports that spraying strawberry plants against *Colletotrichum fragariae* [ibid., xiv, p. 563] with soluble palustrex B [ibid., xiv, p. 519] (15 per cent. copper resinate in an emulsified oil), 1 in 100, and with Bordeaux mixture 4–6–50 plus sodium oleyl sulphate special containing a resin, 1 in 1,000, gave, respectively, increases of 18 and 16 per cent. in the number of plants.

When citrus fruits were treated with various fungicides by W. B. Tisdale and E. West a few hours after picking and stored for four weeks at laboratory temperature, tetra ethyl thiuram monosulphide and a compound containing sodium chlor orthophenylphenate and sodium tetrachlorphenate were at least as effective as borax in preventing decay and caused a less rapid loss of moisture. In many instances these treatments reduced the percentage decay in oranges to less than one-tenth of that in the untreated lots. With grapefruits the reductions in decay while less striking were consistent and significant.

In spraying tests by W. B. Shippey against black spot [*Diplocarpon rosae*: see preceding abstract] on 10 rose varieties the effectiveness of the materials used was as follows (in descending order): Bordeaux mixture, copper-lime dust, ammoniacal copper carbonate, kolodust, florogard dust (sulphur), lime-sulphur, and no treatment.

In the section of this report dealing with the work of the Florida citrus experiment station (pp. 96–100) G. D. Ruehle states that in a grapefruit grove where a normal bloom was set 30 per cent. of the fruits on unsprayed trees became affected by scab [*Elsinoe fawcetti*: see above, p. 778]; one dormant or blossom application of Bordeaux-oil emulsion gave 2 to 5 per cent. scab, while one dormant and one blossom application were slightly more effective. Basic copper sulphate and a proprietary copper-oil were about as effective as Bordeaux, but the second application of the proprietary mixture caused severe fruit burning.

In the section on the work of the Everglades experiment station (pp. 101–131) B. A. Bourne states that tests in various soil types showed the new, promising, early-maturing sugar-cane varieties F. 30–20, 35, 31–669, 304, and 962 to be remarkably resistant to eyespot [*Helminthosporium ocellum*: ibid., xv, p. 606]. Fields of P.O.J. 2714 completely destroyed by *Colletotrichum falcatum* [ibid., xv, p. 607] were replaced by P.O.J. 2725, F. 30–20 and F. 30–35, which have so far remained unaffected.

G. R. Townsend states that common bacterial blight [*Bacterium phaseoli*: ibid., xv, p. 765] of beans [*Phaseolus vulgaris*] appeared on plants raised from seed taken from diseased plants, and spread to plants 90 feet away. It occurred on old and new soil, but appeared to be only seed-borne. Halo blight [*Bact. medicaginis phaseolicola*: see above, p. 766] was uniformly present on old bean land, but absent from 75 per cent. of the new land. Beans growing in saw-grass [*Cladium* sp.] soil in several localities showed evidence of nutritional deficiency; the affected plants recovered their green colour and renewed growth within a week of being sprayed with zinc sulphate solutions of 5–50, 4–50, or 2–50. Most of the unsprayed plants gave no beans. In the last two years mosaic has become serious in a planting of *Amaryllis* [ibid., x, p. 809]; roguing appeared to reduce the number of diseased plants by over 80 per cent. in nine months.

Brown (Nellie A.) & Gardner (F. E.). **Galls produced by plant hormones, including a hormone extracted from Bacterium tumefaciens.**—*Phytopathology*, xxvi, 7, pp. 708–713, 4 figs., 1936.

Red Kidney beans [*Phaseolus vulgaris*], tobacco, sunflower, Paris daisy [*Chrysanthemum frutescens*], privet, and *Impatiens balsamina* all reacted by the production of galls to inoculation with indoleacetic and indolepropionic acids, applied to wounds at the rate of 20 mg. in 1 gm. of a lanoline salve, and with cultures of *Bacterium tumefaciens*, the three first-named hosts giving the most satisfactory results. Tomato and bean stems produced bending and root primordia by surface smearing with the acids without wounding, while galls with root rudiments and witches' brooms were formed on beans as a sequel to decapitating the $\frac{1}{4}$ to $\frac{1}{2}$ in. of stem immediately above the first two primary leaves and smearing the wound with indolepropionic acid. Witches' brooms have also been produced on tomato and geranium [*Pelargonium*] plants by inoculating decapitated stems with *Bact. tumefaciens* cultures. An ethyl ether extract from a *Bact. tumefaciens* culture on a medium of 2 per cent. dextrose, 1 per cent. peptone, a modicum of tryptophane, and the usual inorganic salts was taken up in 0·5 gm. of pure lanoline and applied as described above to bean seedlings and *C. frutescens* stems with positive results, the galls thus induced growing at a similar rate to those caused by smearing with indoleacetic acid [cf. *R.A.M.*, xv, pp. 81, 706].

Bockmann (H.). **Der gegenwärtige Stand der Forschungen über die Fusskrankheiten des Getreides.** [The present status of investigations on the foot rots of cereals.]—*NachrBl. dtsch. PflSchDienst*, xvi, 6, pp. 57–58, 1936.

This is a semi-popular account of the writer's observations (already summarized from other sources) on the environmental factors affecting the development of the two principal forms of foot rot attacking cereals in Germany (especially Schleswig-Holstein), viz., blackleg (*Ophiobolus graminis*) and lodging (*Cercosporella herpotrichoides*) [*R.A.M.*, xiv, pp. 570, 748; cf. also xv, p. 566].

Bockmann (H.). **Untersuchungen über die Schadwirkung von Cercosporella herpotrichoides Fron an Getreide.** [Investigations on the injuriousness of *Cercosporella herpotrichoides* Fron to cereals.]—*Arb. biol. Reichsanst. Land- u. Forstw., Berl.-Dahl.*, xxi, 4, pp. 625–634, 5 figs., 1936.

The results of continued investigations on *Cercosporella herpotrichoides* in Germany [*R.A.M.*, xiii, p. 153, and preceding abstract] showed that the fungus chiefly causes 'lodging' or 'straw-breaking' in winter-sown cereals, among which wheat suffers most from the disease, while rye and barley are rarely attacked very severely, and oats are but slightly affected. Spring cereals are practically immune, presumably owing to the unfavourable weather conditions for the parasite rather than to any resistance of the hosts. In artificial inoculation experiments both in the open and in the greenhouse wheat suffered losses round about 50 per cent., and higher losses were sometimes observed in the fields. Occasionally, however, field losses were inexplicably very slight in spite of heavy initial infection.

Maklakova (Mme G. F.). Оценка значения удобрений и сроков сева в борьбе с ржавчиной зерновых культур. [Estimation of the significance of fertilizers and of the dates of sowing in the control of cereal rusts.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 135–139, 1936.

Brief details are given of experiments in the Voronezh and Leningrad regions in 1935, the results of which again confirm the controlling effect of early sowing of spring wheats on the incidence of rusts (*Puccinia* spp.) [*R.A.M.*, xiv, p. 19]. Organic and mineral fertilizers, on the other hand, had but a comparatively slight effect on rust attack [loc. cit., and above, p. 776], varying with different varieties. Thus, the application of complete mineral fertilizers to the variety Novinka significantly raised the incidence of rust, while with Caesium 111 the tendency, though slight, was towards reducing the amount of rust, and with Lutescens 062 such application gave a distinct lowering of rust incidence. These results would appear to support Gassner's view of a close relationship between the effect of fertilization and rust resistance of the wheat varieties [ibid., xiii, p. 755].

Marland (A. G.) & Kuprianova (Mme V. D.). Закономерности развития корончатой ржавчины (**Puccinia coronifera Kleb.**) Овса в зависимости от метеоролических факторов. [Laws governing the development of crown rust (*Puccinia coronifera* Kleb.) of Oats in dependence on meteorological factors.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 65–67, 1936.

In studies on crown rust of oats (*Puccinia coronifera*) [*P. lolii*] the authors found that the duration of the incubation period varies according to the temperature; thus, with a minimum temperature of 7·2°, mean 10·7°, and maximum 14·3° C., it lasts 14 days, while at 14·6° minimum, 19·3° mean, and 25·1° maximum it is reduced to 7 days. No clear correlation was established between length of incubation and atmospheric humidity. In experiments under constant temperature

conditions, the incubation period of the rust lasted 6 or 7 days at 18° to 20°, and up to 9 days at higher temperatures up to 36°, above which no infection developed. Evidence collected in various parts of the U.S.S.R. indicated the possibility of forecasting outbreaks of crown rust both on *Rhamnus cathartica* and on oats [*R.A.M.*, xv, p. 211 *et passim*].

Boyevski (A. S.). Распространение в посевах инфекции бурой листовой ржавчины Пшеницы. [Distribution in the field of infection by brown leaf rust of Wheat.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 111–116, 1936.

The results of field experiments in 1935 in the Voronezh region showed that spring-sown wheats become infected with brown rust [*Puccinia triticina*] from winter varieties, the spread of the disease occurring earlier (by some 15 days) and infection developing most intensively in the direction of the prevailing winds; both the incidence and intensity of the rust decreased markedly as the distance from the infection focus increased. In a second paper [pp. 116–118] the author states that *Thalictrum* spp. do not appear to play any part in the spring renewal of brown rust, as aecidia on this host only appear towards the middle of June, while sporulating uredosori were already present on wheat on 14th May. There was also clear evidence that local infection foci of crown rust (*Puccinia coronifera*) [*P. lolii*] persist during winter and serve to renew the rust in the spring both on oats and on *Rhamnus cathartica*.

Schliephacke. **Die Gefahren des Weizenbaus und ihre Verhütung.** [The dangers threatening Wheat cultivation and their avoidance.] —*Dtsch. landw. Pr.*, lxiii, 27, pp. 337–338, 2 figs., 1936.

The writer has observed that the dark green coloration of the leaves and stems of wheat varieties susceptible to the brown and yellow rusts (*Puccinia triticina* and *P. glumarum*) is due to the presence on these organs of numerous densely aggregated, fat-exuding hairs to which the spores adhere much more firmly than in the case of the pale green varieties with stiff haulms, narrow laminae, and relatively few hairs, e.g., *Triticum polonicum*. Crosses between the latter and a local Silesian wheat resulted in very resistant progeny. Recent observations by Lieske indicate that the use of raw lignite as a fertilizer reduces the incidence of rust in wheat [see above, p. 783].

Naoumova (Mme N. A.). Зависимость развития желтой ржавчины Пшеницы от метеорологических факторов. [Dependence of the development of yellow rust of Wheat on meteorological factors.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 64–65, 1936.

The author experimentally determined that the length of the incubation period of yellow wheat rust (*Puccinia glumarum* f. *tritici*) varies from 8 to 22 days within a range of temperatures between −1° and 26° C., and tends to be shorter as the general trend of the daily tempera-

tures rises; on wheat plants carrying overwintered intramatrical mycelium of the rust, pustules may be formed in the spring at temperatures as low as 2° to 4°, and may eventually reach maturity. Infection by yellow rust in the spring requires either the presence of drops of water on the leaves or relative air humidities near the saturation point. The length of the incubation period and the dates of the subsequent outbreaks of infection may be determined with the help of nomograms [*R.A.M.*, xv, pp. 522, 562].

Kikoina (Mme R.). Ржавчина Пшеницы в Азово-Черноморском и Северо-Кавказском краях и меры борьбы с нею. [Wheat rusts in the Azoff–Black Sea and North Caucasus regions, and their control.] —*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 101–103, 1936.

In the Azoff–Black Sea and North Caucasus regions brown wheat rust [*Puccinia triticina*] has been found usually to overwinter as mycelium in wheat plants, but in very cold and snowless winters, the rust is killed; black rust [*P. graminis*], however, has never been found in these areas overwintering on the cereals, and barberries play an important part in the renewed spring infection of this rust. Experiments in 1933 showed that eight sulphur dustings (at the rate of 40 kg. per hect.) of wheat during the season reduced the amount of rust from 11·3 to 4·1 per cent. at the earing, from 50·7 to 18·6 per cent. after the flowering, and from 66 to 46·6 per cent. at the milky maturity stages; the treatment increased the number of wheat grains in the ear by 21 per cent., and the yield by 84·4 per cent. [cf. *R.A.M.*, xiv, p. 18].

Gurevitch (M. J.), Kuprianoff (V. A.), & Proyda (P. A.). Мероприятия по борьбе с головней хлебных злаков в северных условиях. [Measures employed under northern conditions for the control of cereal smuts.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 144–147, 1936.

From a survey of the results of laboratory and field investigations in 1934 in the Leningrad region the authors conclude that the best control of wheat bunt [*Tilletia caries* and *T. foetens*] was obtained by treating the seed-grain with either full-strength AB dust (1·5 gm. per kg.) [*R.A.M.*, xiv, p. 47], PD dust containing 10 per cent. arsenious oxide (0·75 gm. per kg.), magnesium arsenite plus 3 per cent. acidol [ibid., xv, p. 565] and 5 per cent. arsenious oxide [dose not indicated], A_{10}, B_{10}, and B_{12} dusts (1·5 gm. per kg.), or formalin-treated peat (17·7 per cent. formalin) at the rate of 7·5 gm. per kg. (the treated wheat is kept covered with sacks or tarpaulins for two hours). Evidence was obtained that in the north the moisture content of cereal seed-grain at the time of sowing is an important factor in the amount of bunt in the ensuing crop; thus, spring Novinka wheat grain with 17·9 per cent. moisture produced 13·3 per cent. bunt, while that with 13·5 per cent. moisture only gave 1·1 per cent. bunt. Yarovization [vernalization; ibid., xv, pp. 489, 708] of spring wheat grain reduced the amount of bunt from 13 to 0·9 per cent., and artificial infection of the vernalized wheat grain only increased the amount of bunt to 1·4 per cent.

Gorlenko (M. V.). Испытание протравителей и способов протравливания семян хлебных злаков против головни. [Tests of seed disinfectants and seed disinfection methods for the control of cereal smuts.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 150–152, 1936.

The amount of bunt [*Tilletia caries*] in wheat raised from seed-grain artificially infected with bunt spores (0·1 per cent. by weight) was reduced from 35 per cent. in the control to 1 and 0·7 per cent. when the seed-grain was dusted with magnesium arsenite [see preceding abstract] at the rates of 0·75 and 1 gm. per kg. seed, respectively. Dusting the infected wheat grain with double superphosphate [*R.A.M.*, xv, p. 432] at the rate of 6 gm. per kg. reduced the bunt to 3 per cent. In tests with millet [*Panicum miliaceum*] smut [*Ustilago panici-miliacei*: *R.A.M.*, xv, p. 646] dusting the infected seed with magnesium arsenite (1 gm. per kg.) reduced the smut from 54·3 per cent. in the control to 5·4 per cent., and it is believed that higher doses of the fungicide may give better control. Very good control (0·15 per cent. as against 10·6 per cent. in the untreated grain) of loose smut of oats [*U. avenae*] was obtained by mixing smutted oat seed-grain with formalin-treated peat (10 gm. per kg.) and keeping the seed covered with sacks for two hours.

Ryzhkova [Ryjkova] (Mme Z. F.). Влияние удобрения на проявление твердой головни на яровой Пшенице. [Influence of fertilizers on the appearance of bunt on spring Wheats.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 134–135, 1936.

The results of experiments in the Voronezh region during the cold and rainy spring of 1935 showed that sowing Caesium 0111 wheat seed-grain, artificially infected with bunt spores [*Tilletia caries* and *T. foetens*], immediately over superphosphate (60 kg. per hect.) or sylvinite (30 kg.) drilled into the soil delayed the emergence of the seedlings by six days and considerably reduced the density of the stands; the plants only caught up with the controls after the flowering stage. The incidence of bunt was 86 per cent. on the control, 35 per cent. on the superphosphate plot, and 63·3 per cent. on the sylvinite plot.

Lobik (V. I.) & Dahlstrem (A. F.). Уточнение лабораторной методики проращивания спор мокрой головни. [Improvement of methods for the germination of Wheat bunt spores in the laboratory.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 177–178, 1936.

Excellent results were obtained in toxicity tests of fungicides against wheat bunt (*Tilletia tritici*) [*T. caries*] by germinating the spores on disks of white blotting paper on the surface of a layer of soil of known composition and moisture content in small Petri dishes which are then incubated at determined temperatures, the advantage of this method being that on the white ground the germination of the bunt spores is visible to the naked eye. The optimum temperature for germination of *T. caries* spores was found to be 15° to 18° C. and the optimum soil humidity 40 to 50 per cent. [cf. *R.A.M.*, iii, p. 512]. At 25° only a few

spores germinated, while at 5° germination was abundant but lasted much longer (7 or 8 days), and was much depressed by humidities above 20 to 30 per cent. Light did not affect germination. Of the liquid media tested the best germination of *T. caries* was obtained in 0·05 or 0·1 per cent. calcium nitrate solution and in tap water. The results of another series of experiments indicated that freshly collected spores of *Ustilago hordei*, *U. avenae*, and *U. panici-miliacei* do not germinate as freely in the laboratory as spores that are kept for several days at room temperature [ibid., xiii, p. 749]. The temperature ranges for germination were 5° to 30° for *U. avenae* (optimum 15° to 25°) [ibid., iii, p. 128; vi, pp. 399, 411], 5° to 32° for *U. hordei* (optimum 15° to 25°), and 10° to 35° for *U. panici-miliacei* [see above, p. 786] (optimum 22° to 30°).

Gassner (G.) & Kirchhoff (H.). **Die Bedeutung der Wasseraufnahme des Weizenkorns, insbesondere des Weizenembryos, für Wirkung und Wirkungsweise der Warmwassertauch- und benetzungsbeize.** [The significance of the water absorption of the Wheat seed-grain, especially of the Wheat embryo, in relation to the effect and mode of action of the hot-water immersion and moistening methods of disinfection.]—*Phytopath. Z.*, ix, 3, pp. 229–258, 9 graphs, 1936.

The fungicidal treatment of wheat seed-grain by moistening in closed vessels [*R.A.M.*, xiii, p. 750] has been found to lend itself particularly well to the detailed observation of the process of water absorption by the seed-grain and its individual components, especially the embryo, in relation to temperature conditions. Both this process and its sequel, the gradual migration of the absorbed water from the embryo to the endosperm, are strongly influenced by the prevailing temperature, the maximum absorption being reached after 8, 4, and 1½ to 2 hours, respectively, at pre-soaking temperatures of 1°, 10°, and 20° C., respectively, and after 1 hour at 30°. The impairment of germination resulting from the subsequent treatment of the seed-grain by rotation of the containers in water at temperatures upwards of 50° for varying periods is more marked after a medium duration of pre-soaking than after either a long or a short one. A lengthy period of pre-soaking, involving as it does the gradual transference of the water content of the embryo to the endosperm, was found to enhance the efficacy of the treatment against loose smut (*Ustilago tritici*) [see next abstract].

Similar considerations are applicable to the treatment of the seed-grain by immersion in hot water, except that in this case matters are simplified by the absence of any modification in the water content of the embryo due to the migration of moisture into the endosperm. In order to ensure absolute elimination of infection by 10 minutes' treatment at 52°, 65 to 70 parts of water (calculated as a percentage of the dry matter) must be taken up by the embryo. In both methods the pre-soaking temperature operates indirectly by influencing the velocity and the course of the accompanying changes in the embryo, and not, as suggested by Appel and Riehm (*Arb. biol. Reichsanst. Land- u.*

Forstw., *Berl.-Dahl.*, viii, p. 343, 1911), by any specific action on the mycelium of the fungus.

KUPRIANOFF (V. A.) & PROYDA (P. A.). Испытание термического протравливания в борьбе с пыльной головней в северных условиях. [Tests of the hot-water disinfection of Wheat seed-grain in the control of loose smut under northern conditions.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr.*, *1935*, pp. 153–154, 1936.

The results of tests in 1935 in the Leningrad region showed that seed-grain of the spring wheat Novinka infected by loose smut (*Ustilago tritici*) and containing from 14·2 to 20 per cent. moisture, may be safely subjected, after pre-soaking, to hot-water treatment [*R.A.M.*, xv, pp. 636–637 and preceding abstract] at 52° C. for 8 minutes, and at 53° for 7 minutes; slightly longer steeping (by up to 2 minutes) may result in a slight decrease in the germinability of the grain (by up to 5 per cent.), and in a considerable reduction in the vigour of growth of the seedlings. Grain with higher moisture content should be possessed of normal germinability before treatment, since less viable seed may give much reduced stands after treatment. Seed-grain of Wiener barley containing 15·3 per cent. moisture did not show any reduction of viability after the usual period of hot-water treatment. Vernalization [see above, p. 785] of wheat seed-grain had no controlling effect on the development of loose smut.

TUPENEVITCH (S. M.). Оценка сроков посева и яровизации яровых Пшениц в борьбе с фузариозным заболеванием. [Estimation of the effect of dates of sowing and of vernalization of winter Wheats on the control of *Fusarium*-induced diseases.]—*Summ. sci Res. Wk Inst. Pl. Prot. Leningr.*, *1935*, pp. 126–128, 1936.

The results of experiments from 1932 to 1935 in various parts of central and northern Russia showed that wheat seedlings germinated at a temperature of 8° to 10° C. developed considerably more vigorously and formed a much heavier root system than those germinated at 18° to 24°, and in soil artificially infected with *Fusarium graminearum* [*Gibberella saubinetii*: *R.A.M.*, xv, p. 640] the former were much less severely attacked by the fungus than the latter. It was also shown that at 5·6° to 10·6° *G. saubinetii*, *F. culmorum* var. *lethaeum* [*F. culmorum*], and *F. avenaceum* [loc. cit.] grew much more slowly in pure culture than at 18° to 25°. In the field early-sown spring wheats were only slightly attacked by *Fusarium* sp., while later-sown ones suffered much more both in the seedling and subsequent stages of growth. Vernalization [see preceding abstract] of 18 wheat varieties hastened the germination of seed-grain, increased the density of the stands, and decreased the amount of infection of the seedlings with *Fusarium* spp. Vernalization of *Fusarium*-infected wheat grain, however, decreased its viability and reduced the density of the resulting stands by from 25 to 75 per cent., but disinfection of the infected seed with germisan or the preparation AB [see above, p. 785] before vernalization considerably reduced the losses due to this cause.

TUPENEVITCH (S. M.), BUTYLINA (Mme V. I.), LISSITZINA (Mme M. L.), & OSTREYKOVSKI (M.). Оценка сортов яровой Пшеницы на устойчивость к фузариозу. [Evaluation of spring Wheat varieties for resistance to *Fusarium*-induced diseases.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr.*, *1935*, pp. 139–141, 1936.

A summarized account is given of greenhouse experiments, in which the resistance of a number of spring wheat varieties to *Fusarium culmorum* var. *lethaeum* [*F. culmorum*], *F. avenaceum*, *F. graminearum* [*Gibberella saubinetii*: see preceding abstract], and *Helminthosporium sativum* [*R.A.M.*, xv, p. 639] was tested in soil inoculated with pure cultures of the fungi. The results, supported by field observations in various districts of central and northern Russia, showed that the *lutescens* variety Africa (VIR 25652), the *ferrugineum* varieties Huron and Finnland (28314), and the variety Aurora 1774 suffered very little *Fusarium* injury to the ears, while *Triticum timopheevi* [ibid., xv, p. 352] was almost entirely immune from it. A fairly high correlation was established between the degree of attack of the grain by *Fusarium* spp. and its water content at the milky and waxy stages of maturity. The varieties Erythrospermum 01/78, Leda 47, Milturum 0321, and Sarrubra showed a higher degree of resistance to foot rot caused by *H. sativum* than Caesium 0111.

GORLENKO (M. V.). Оценка сортов яровой Пшеницы на устойчивость к фузариозу, мучнистой росе и бурой ржавчине. [Evaluation of spring Wheat varieties for resistance to *Fusarium*-induced diseases, powdery mildew, and brown rust.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr.*, *1935*, pp. 141–143, 1936.

The 59 lines of wheat belonging to several botanical species and varieties which were tested in 1935 at Voronezh fall into four groups according to their degree of resistance to foot and ear attack by *Fusarium avenaceum*; besides the varieties enumerated in the preceding abstract, the resistant group also includes Caesium 0111, Milturum 0321, and 0274, Preston, Kazanskaya 1/1[a], Germania 19138, Uzbekistan 7264, *Triticum spelta* var. *vulpinum*, and *T. dicoccum* 250. Field observations during the epidemic outbreak of *Erysiphe graminis* in 1935 showed that *T. timopheevi*, *T. monococcum*, *T. persicum*, *T. polonicum*, *T. turgidum*, and the soft wheat varieties Preston, Germania 19138, Finnland 28314, Tulun ZA/32, Australia 13274, and Aurora 1774 remained entirely immune, while all the durum wheats (except Syria 17139), and among the soft wheats Garnet DS–12, Argentina 146797, 146800 and 146808, Africa 25652, SASSh 25665, and *T. dicoccum* var. *farrum* were highly resistant (not over 10 per cent. infection). No brown rust (*Puccinia triticina*) infection was found on *T. timopheevi*, *T. monococcum*, *T. turgidum*, or on the varieties Africa 25652 and SASSh 25665.

TUPENEVITCH (S. M.) & SHIRKO (V. N.). Изучение условий гибели озимых от выпревания. [Investigation of the conditions conducive to winter killing of winter-sown cereals.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr.*, *1935*, pp. 143–144, 1936.

After a brief reference to the very considerable losses in the U.S.S.R.

caused in autumn-sown cereals by the so-called winter injury (usually attributed to *Fusarium nivale* [*Calonectria graminicola*] but the rôle of which is uncertain, and other species of *Fusarium*), the authors give a concise summary of experiments, the results of which indicate that the injury may be effectively controlled, if not completely suppressed, by cultural measures calculated to prevent the accumulation and retention of excessive moisture in the soil in the autumn and the spring, as well as by sowing resistant wheat varieties, such as Moskowskaya A–27 and 2411, and Durable. Adequate soil fertilization appeared to increase the resistance of all the varieties tested to winter injury.

LEUKEL (L. W.). **Factors influencing infection of Barley by loose smut.** —*Phytopathology*, xxvi, 7, pp. 630–642, 1936.

Further studies on the factors governing infection of barley (Alpha and Wisconsin Pedigree varieties) by *Ustilago nigra* [*R.A.M.*, xv, p. 641] indicated that soils with a high percentage of saturation are generally unfavourable to the development of the fungus, especially at 5° and 30° C., while a relatively dry soil promoted infection at 5°. At temperatures between these extremes differences in soil moisture from 30 to 55 per cent. saturation did not seem to affect the incidence of *U. nigra*, fairly high percentages of infection by which were secured from 10° to 25°, with an optimum at 15° to 20°, the minimum and maximum being below 5° and above 30°, respectively. *U. nuda*, on the other hand, showed little or no reaction to temperature fluctuations. Plants grown to emergence at 30° and then transferred to a soil temperature of 13° contracted less infection by *U. nigra* than those maintained at 30° until near heading. Plants transferred at emergence from a temperature of 13° to either 5° or 30° showed a highly significant decrease of infection compared with those kept at 13°; similarly, those removed at emergence from 5° to 13° or 30° showed a marked increase of disease compared with the series maintained at the lower soil temperature. Infection by *U. nigra* was experimentally shown not to occur after the emergence of the first leaf.

MCKAY (R.). **Method of infection of Oat grain with Ustilago avenae and the influence of external factors on the incidence of the disease.**— *Sci. Proc. R. Dublin Soc.*, N.S., xxi, 27–34, pp. 297–307, 1 pl., 1936.

In experiments carried out in Ireland from 1933 to 1935 Potato oats inoculated with loose smut (*Ustilago avenae*) either at and immediately after flowering, or by contamination of seed-grain, both with hulls intact and removed, were sown in two successive years under identical conditions and the amounts of infection compared.

In the first year the flower-inoculated oats gave the highest percentage infection in one experiment only. In the second season shelled grain contaminated before sowing gave the most infection, followed by grain contaminated with the hulls intact, and then by the flower-inoculated oats.

Dehulling flower-inoculated oats reduced infection by from 35 to over 50 per cent. [*R.A.M.*, xv, p. 711]. Washing grain with hulls intact derived from flower-inoculated oats reduced infection by from 32 to 56 per cent. Dehulling and washing flower-inoculated oats reduced

infection by from 62 to 79 per cent. in the case of a pure line strain of loose smut, and by from 90 to 96 per cent. in the case of mixed strains. It is concluded that most of the infection shown by the flower-inoculated oats was due to ungerminated spores within the glumes, and not to resting mycelium [cf. ibid., ii, p. 214; xii, p. 431].

During winter, examination of artificially flower-inoculated oats and grain from naturally smutted crops revealed both resting mycelium and viable ungerminated spores within the glumes, sufficient of the latter being present to account for any infection appearing in the following crop.

Rivier (A.) **Essais comparatifs de traitement du charbon nu de l'Avoine.** [Comparative trials of the control of Oat loose smut.]—*Rev. Path. vég.*, xxiii, 3, pp. 215–229, 3 graphs, 1936.

Full details are given of experiments on the control of *Ustilago avenae* carried out on oat seed of the Noire d'hiver de Belgique variety from 1933 to 1935 in France. The seed was inoculated with *U. avenae* at the rate of 1 gm. per kg. and sown on various dates after treatment with formalin (2·5 parts per mille for 20 mins.) or different dusts. In both years complete control was given by the formalin treatment for all sowings. The dusts used in 1933–4 (cupric chloride and talc, 10 : 90; copper sulphate and talc, 25 : 75; and basic copper carbonate ($CuCO_3 3CuO$), alum, and talc, 25 : 25 : 50, all at the rate of 350 gm. per q.) completely failed to give satisfactory control, while in 1934–5, dusts of similar composition but modified proportions were unsatisfactory and commercial dusts B and P were not effective at the rates recommended.

Marschner (G.). **Die Dörrfleckenkrankheit. Eine bisher wenig beachtete Haferkrankheit der schweren Bruchböden.** [Grey speck disease. An as yet little regarded Oats disease of heavy fallow soils.]—*Dtsch. landw. Pr.*, lxiii, 23, p. 288, 1936.

Some improvement has been effected in the condition of oats suffering from grey speck [*R.A.M.*, xv, p. 356 and next abstract] in heavy fallow soils by application to the soil of potassium nitrate (100 to 200 kg. per hect.), followed by rolling. Manganese sulphate at a similar rate may also prove helpful, more plentiful applications being desirable in the case of soils with a strongly alkaline reaction (P_H 7 and upwards). Preventive measures include the choice of lighter soils, with the application of a physiologically acid ground and top dressing, the admixture of some rye or barley (where conditions are suitable) with the oats, and a judicious scheme of crop rotation so as to avoid the development of the excessive alkalinity liable to accompany the sugar beet-wheat-barley sequence.

Rademacher (B.). **Gibt es gegen Dörrfleckenkrankheit widerstandsfähige Hafersorten?** [Are there any varieties of Oats resistant to grey speck?]—*Dtsch. landw. Pr.*, lxiii, 29, p. 362, 2 figs., 1936.

In connexion with the varietal trials of some 170 selections of oats for their reaction to grey speck [see preceding abstract] conducted by the writer in two localities of Schleswig-Holstein, one on bog and the other on sandy humus soil, growers are warned not to judge exclusively by external symptoms, which may or may not be accompanied by

reduced yields, while conversely, the latter feature is not necessarily reflected in the outward appearance of the plants. Of the officially approved German varieties included in the tests, Rotenburg Black and Black President showed a conspicuous degree of resistance not shared by any of the white or yellow types, among which the most promising were Fischers Wirchenblatter III, Fichtelgebirgs, Lembkes Baldur, Lischower Early, Lüneburger Kley, Peragis, and Heines Silver. Resistant foreign varieties were Svalöfs St. 01320 and 01340 and Engelbrecht II, Glocken [Bell] II and III, Grand Mogul, Orion II, Weibulls Argus, Fyris, and Melöj III (all Swedish), Lyngby Heath (grey) and Borries (Danish), Nopsae I (Finnish), Black President (Dutch), Garton's Scotch Potato, Vilmorin's Siberian Early and Black Ligowo-Brie (French), and Burt (American). Referring to the efficacy against grey speck of ammonium sulphate and superphosphate, the writer states that the latter is surpassed by basic slag, the superiority of which is presumably due to its relatively substantial manganese content.

Rademacher (B.). **Die Heidemoorkrankheit (Urbarmachungskrankheit) unter besonderer Berücksichtigung der Kupferfrage.** [The heath moor disease (reclamation disease), with especial reference to the copper question.]—*Arb. biol. Reichsanst. Land- u. Forstw., Berl.-Dahl.*, xxi, 4, pp. 531–603, 7 figs., 4 maps, 1936.

The author briefly reviews the results of investigations up to date on the incidence, geographical distribution, and the causes of the so-called reclamation disease of various crops in Europe [*R.A.M.*, xiv, pp. 254, 575; xv, p. 493], and states that of all the suggestions advanced to explain its causes, that of copper deficiency appears to be the most likely. Heath moor soils are usually poor but not entirely deficient in copper, the balance of evidence obtained in special tests showing that copper is present in quite appreciable quantities, but in a form unavailable to plants; humus appears to be especially responsible for the fixation of the copper, the fixing substances in it apparently being tannin, lignin, and humic acids. Copper deficiency in such soils is further increased by the cultivation of removable crops, and may be remedied by growing meadow grasses or green manure crops, especially of deep-rooted plants that help to dissolve and bring up the fixed copper from the lower to the upper soil levels. The incidence and severity of the disease appear to be inversely correlated with the amount of water supply in the soil, but are independent of the soil reaction; there was evidence, however, that copper applications were not effective in the control of the trouble in soil with a reaction unfavourable for the relative crop. Excess lime also appeared to inhibit the curative effect of copper applications. Nitrogen applications led to an increase in the severity of the disease; potassium, on the other hand, was beneficial; while magnesium had no specific effect. No evidence was forthcoming that excess phosphorus played any important part in the disease. The cases in which grey speck of oats followed the application of copper are possibly explained by the assumption that the soils in question are also deficient in manganese, the symptoms only appearing after the copper deficiency has been remedied. While the symptoms of the disease in low-lying moors differ

somewhat from those on higher ground, the fact that in such moors increased yields are obtained from copper applications would indicate that there also the trouble is due, in part at least, to copper deficiency.

The main crops are divided into three classes according to their susceptibility; white and yellow oats, winter and summer barley, and wheat are very strongly susceptible; black moor oats, four-rowed barley, cruciferous crops, carrots, field peas, broad beans (*Vicia faba*), yellow lupins (*Lupinus luteus*), and red clover (*Trifolium pratense*) are moderately to slightly susceptible; and rye, potatoes, *V. villosa*, *Ornithopus sativus*, white clover (*T. repens*), *Lotus uliginosus*, *Spergula arvensis*, and buckwheat are slightly susceptible to immune. Apart from the usual symptoms, in fields which begin to suffer from copper deficiency the affected cereal crops may only show an unfavourable straw to grain ratio which is very often attributed to other causes. There was evidence of specific and varietal variations in susceptibility of the different crops, which may be useful to geneticists for the production of resistant strains.

The trouble is amenable to control either by agricultural methods directed towards releasing and rendering available the fixed copper in the soil or, in very severe cases, by the application of copper compounds (chiefly copper sulphate) to the soil, and spraying affected cereal plants with cupric solutions.

The paper terminates with a bibliography of 133 titles.

Boewe (G. H.). **The relation of ear rot prevalence in Illinois Corn fields to ear coverage by husks.**—*Plant Dis. Reptr*, xx, 10, pp. 165–172, 2 graphs, 1936. [Mimeographed.]

From a five-year survey [the statistical data of which are tabulated] in Illinois of the correlation between maize ear rot and the extent of coverage of the ears by the husks, it appears that infection by smut [*Ustilago zeae*: *R.A.M.*, xv, p. 572], *Fusarium moniliforme* [*Gibberella moniliformis*: ibid., xv, p. 494], and *Penicillium* [ibid., xiv, p. 232; xv, p. 360] is favoured by imperfect coverage, whereas complete coverage assists invasion by *Diplodia* [*zeae*: ibid., xv, p. 290] and *G.* [*saubinetii*: ibid., xv, p. 360]. This factor exercised no appreciable influence on the incidence of infection by *Rhizopus*, *Aspergillus* [ibid., xiv, p. 232], and *Basisporium* [*Nigrospora* sp.: ibid., xv, p. 574]. The average percentage of prevalence of *G. moniliformis* during the period under review was 40·7, the corresponding figures for *Penicillium*, *Rhizopus*, *U. zeae*, and *D. zeae* being 5·8, 3, 1·7, and 1·2, respectively, while the other diseases caused under 1 per cent. infection.

Edwards (E. J.). **Maize seed selection and disease control. The problem of internal seed-borne infection.**—*Agric. Gaz.*, *N.S.W.*, xlvii, 6, pp. 303–306, 5 figs., 1936.

In Australia the principal organisms producing rotting of the cob and grain tissues of maize are *Gibberella saubinetii* [*R.A.M.*, xv, p. 644], *G. moniliformis*, *G. fujikuroi* var. *subglutinans* [ibid., xv, p. 359], these three fungi causing *Fusarium* rot, and *Diplodia zeae* [ibid., xi, pp. 157, 778; and preceding abstract], responsible for dry or *Diplodia* rot. After briefly describing the symptoms produced by the four organisms the

author discusses the problem of control and points out that owing to the prevalence of internal, seed-borne infection no grain can be selected as entirely free from potential disease-producing organisms. The fungi causing the chief maize diseases are not always seed-borne, and may live over from season to season on old diseased stalks and plant refuse left in the field after harvesting. Hence, the control of these diseases depends primarily on thorough field sanitation, including the regular burning of the old stalks and systematic crop rotation, combined with which seed selection is of unquestionable value. Experiments in seed treatment with organic mercury dusts were instituted in 1935.

ULLSTRUP (A. J.). **The occurrence of Gibberella fujikuroi var. subglutinans in the United States.**—*Phytopathology*, xxvi, 7, pp. 685–693, 2 figs., 1936.

The occurrence of *Gibberella fujikuroi* var. *subglutinans* on old maize stalks [see preceding abstract] is reported from Ohio and New Jersey, and the morphological and cultural characters of the fungus are described in considerable detail. The author inclines to the view that the fungus is a recent introduction into the United States.

GIRTON (R. E.). **Sterilization of Corn grains with sodium hypochlorite.** —*Plant Physiol.*, xi, 3, pp. 635–639, 1 fig., 3 graphs, 1936.

Fungal infection [species unspecified] of Krug yellow dent maize seed-grain was reduced from 13 to 2 per cent. in one experiment by 5 hours' immersion in a solution of commercial sodium hypochlorite [cf. *R.A.M.*, xii, p. 743; xiii, p. 781]; there was, however, a corresponding depression of germination from 100 to 80 per cent. These results were in general confirmed by a second trial in which a marked reduction of infection (from 11·5 to 1·75 per cent.) resulted from a suction injection treatment involving the rapid removal of air bubbles from the grains; this was followed by shaking for 2½ hours.

UPPAL (B. N.) & WESTON (W. H.). **The basis for merging Sclerospora indica with Scl. philippinensis.**—*Indian J. agric. Sci.*, vi, 3, pp. 715–719, 1 pl., 1936.

An account is given of the writers' comparative studies on living and preserved material of *Sclerospora indica* and *S. philippinensis* [*R.A.M.*, xv, pp. 283, 546] from maize, whence it appears that in all essential features the two species are identical. In both the total conidiophore length ranges from 150 to 410 μ (usually 300 to 350 μ), the maximum diameter of the main axis is 20 to 25 μ, the basal cell measures 80 to 100 by 9 to 11 μ, and the sterigmata average 14 to 15 μ. The conidia of both fungi are elongate-ellipsoid, elongate-ovoid, or rotund-cylindrical; in respect of length frequencies, 60 per cent. of the Indian material falls within the range of 33 to 41 μ, and 65 per cent. of the Philippine measures 31 to 39 μ, while the width frequencies overlap practically throughout the entire range of spore measurements. The slightly narrower tendency of *S. indica* has been tentatively attributed by E. J. Butler in recent correspondence to the variability inherent in geographical races of the same fungus. Taking all these points into consideration, there seems to be no adequate reason for the maintenance

of *S. indica* as a distinct species, and its inclusion within *S. philippinensis* is therefore proposed.

Chowdhury (S. C.). **A disease of Zea mays caused by Colletotrichum graminicolum (Ces.) Wils.**—*Indian J. agric. Sci.*, vi, 3, pp. 833–843, 2 pl. (1 col.), 1 graph, 1936.

The writer describes the morphological, pathogenic, and cultural characters of *Colletotrichum graminicolum* [*R.A.M.*, xv, p. 558], the agent of a maize disease at Pusa characterized by the presence on the leaves of small, brownish spots, originating on the upper side of the central midrib and gradually elongating in both directions, so that they often reach from the leaf sheath to the tip. The centres of the spots turn straw-coloured and bear the minute, black, circular or oval acervuli of the fungus, which have only been obtained in small numbers in culture on maize and oatmeal agars. Under the relatively poor conditions for growth prevailing in artificial culture *C. graminicolum* forms numerous dark brown, mostly spherical or piriform appressoria, 8 to 15 μ in diameter, frequently showing a clear, white spot (the so-called 'germ-pore') near the centre. Conidial germination is favoured by high humidity and the presence of sugar or of living plant tissues, the optimum temperature for the process being 25° to 30° C.

All parts of the plant were shown by inoculation experiments to be susceptible to invasion by *C. graminicolum*, which further infected in the laboratory barley, oats, wheat, sorghum, *Panicum typhoideum*, *Eleusine indica*, *Setaria italica*, *Euchlaena mexicana*, *P. frumentaceum*, and *Paspalum scrobiculatum*. The strain of the fungus from sorghum was found to be capable of infecting maize, and vice versa.

Uppal (B. N.) & Kamat (M. N.). **Gummosis of Citrus in Bombay.**—*Indian J. agric. Sci.*, vi, 3, pp. 803–822, 3 pl., 2 graphs, 1936.

Mosambi oranges (*Citrus sinensis*) in the Bombay Deccan are stated to suffer extensively from gummosis, caused by a typical strain of the 'rubber group' of *Phytophthora palmivora* [*R.A.M.*, xiii, p. 77; xiv, p. 627; xv, p. 482], the morphology of which is fully described. The disease, which is most prevalent during the rains and very destructive in young plantings, attacking 20 to 25 per cent. of the trees, is characterized by copious exudations of resin and cracking of the cortex of the trunk for considerable distances upwards from the bud union, but a more serious aspect of the trouble lies in the lateral spread of infection. Mosambi fruits (and those of santra or mandarin, *Citrus nobilis* var. *deliciosa*, lying on the ground) are also liable to invasion by the fungus and develop brown rot. Details are given of inoculation experiments with fragments of *P. palmivora* mycelium from oatmeal agar cultures on different *Citrus* species which showed varying resistance.

Gummosis may be prevented by grafting sweet, commercial citrus varieties on a sour resistant stock, such as jamburi. Neither soil nor irrigation water should be brought into contact with the bud union, through which infection from these sources may penetrate the cortical tissue. Promising results were also given by decortication, followed by the application to the exposed surface of 25 to 30 per cent. creosote oil, and if necessary, by painting with coal-tar.

La gommose parasitaire des Aurantiacées, Phytophthora parasitica Dastur. [Parasitic gummosis of the Aurantieae, *Phytophthora parasitica* Dastur.]—*Memento Direc. Agric., Rabat*, 35, 7 pp., 1 pl., 1 fig., 1935. [Received October, 1936.]

A brief, popular account is given of the symptoms, causal organism, losses caused by, and control of parasitic gummosis of citrus in Morocco where the disease is caused by *Phytophthora parasitica* [*R.A.M.*, xv, p. 575]. The use of resistant stocks such as *Citrus bigaradia* [*C. aurantium*] or *C.* [*Poncirus*] *trifoliata* and the usual methods of control are recommended.

Rhoads (A. S.). **Blight—a non-parasitic disease of Citrus trees.**—*Bull. Fla agric. Exp. Sta.* 296, 64 pp., 2 figs., 1936.

A full account is given of a twelve years' study of the non-parasitic blight of citrus that has been present in Florida for over 50 years. The disease occurs sporadically throughout a large part of the citrus area, but is of major importance at present only in a few localities.

A careful survey in a badly affected area in 1924 showed that out of 919 trees inspected, 44·4 per cent. were blighted or had been removed because diseased, the corresponding figures for two other localities being 41·8 and 59·3 per cent. The disease not only destroys hundreds of fine trees annually in Brenard County, but the replacement of the declining trees results in the presence of trees of different ages in the groves, the market value of which is consequently much reduced.

Blight takes the form of a chronic wilt and decline, usually starting on one side of a tree, and progressing until the whole top is affected. If it develops early in the season, the affected branches die, and the fruit withers and falls before reaching maturity. If the affected branches do not die too early the fruit may reach maturity, but much is below commercial size and of a strongly acid flavour. Blooming is greatly delayed, and may be abnormally heavy, in which case the blossoms are small and weak, and the branches soon wither and die. The spring flush of growth is delayed and generally reduced in amount. When the decline is slow, the larger, defoliated branches may put forth a sparse new growth late in spring, which, except for the watersprouts developed from the upper trunk and lower main limbs, is small and under-sized. The leaves are small and dingy green. Watersprouts develop after half to two-thirds of the crown has died, and grow vigorously for a time, but wilt during prolonged drought, though they are the last part of the crown to die.

No causal organism has been found, and the condition is not contagious or transmitted by budding or grafting. The evidence indicates that it is caused by extreme fluctuations of soil moisture, including both deficits of moisture on the lighter soils and excesses on the poorly drained one and combinations of the two. The physical structure of the soil, kind of rootstock, and grove management are regarded as contributing factors.

A similar but less frequent wilt and decline of citrus, included under the composite term blight, is attributed to droughty periods following unusual rise in the water-table not only in poorly drained low soils but also in low places in upland soils.

No adequate method of control is known, but it is suggested that in planting new groves unsuitable land should be avoided, underlying rock should be removed and hard pan broken up, adequate drainage should be provided, irrigation adopted or, in its absence, the cover crop should be mown, the best cultural practice should be followed, and ground furrowed on contour lines to reduce running-off of surface water.

McGeorge (W. T.). **Some aspects of Citrus tree decline as revealed by soil and plant studies.**—*Tech. Bull. Ariz. agric. Exp. Sta.* 60, pp. 329–370, 3 graphs, 1936.

The Arizona soils in which citrus (orange and grapefruit) trees are affected by chlorosis [*R.A.M.*, xiv, p. 561; xv, p. 496] and 'crazy top' were found to be generally above the average in P_H value. Leaf analyses showed a lower calcium and higher water-soluble alkalinity of ash in the foliage suffering from chlorosis and allied physiological disturbances, such as mottle leaf [ibid., xv, p. 714], as compared with normal material. The ash of juice from fruit produced by diseased branches showed an abnormally high water-soluble alkalinity, hydrogen-ion concentration, and total acidity, indicating a higher buffered state. Judging by experimental observations on maize, buckwheat, and cow-peas, lower calcium and higher water-soluble alkalinity appears to be a feature of plants growing on alkaline-calcareous soils. Encouraging results have been given by the application of sulphur to trenches at the base of the trees at the rate of 25 to 50 lb. per tree and by the incorporation of sulphuric acid with the irrigation water at the rate of 8 lb. per tree, and the practical possibilities of a commercial extension of these methods are discussed.

A condition locally known as 'pink nose' was observed in 1934 to be characterized by the same general chemical relationships as those found in the foregoing nutritional disorders. The fruit was of poor keeping quality, but the leaves, as in the case of 'crazy top', were not chlorotic.

Winston (J. R.). **A method of harvesting Grapefruit to retard stem-end rot.**—*Circ. U.S. Dep. Agric.* 396, 8 pp., 6 graphs, 1936.

Investigations begun several years ago in Florida to determine whether citrus fruits instead of being clipped from the trees can safely be pulled, thereby separating the source of infection by stem-end rot (*Diplodia natalensis* [*R.A.M.*, xv, p. 499] and *Phomopsis* [*Diaporthe*] *citri* [ibid., xv, p. 717]) on the twigs from the fruits and reducing the risk of disease, showed that the rind of tangerines tears too easily for pulling to be practicable, while oranges can be successfully pulled only while fully ripe, but grapefruit can be pulled at almost any time. Pulled grapefruit, unless very ripe, was less rapidly affected by stem-end rot than clipped fruit, three years' tests showing that after 30 days storage at 70° F. the pulled and clipped fruit had, respectively, about 14 and 40 per cent. decay, the corresponding figures for borax-treated fruit being about 12 and 25 per cent. When the fruit was held at 55° the amount of decay after 60 days for the clipped untreated, clipped borax-treated, pulled untreated, and pulled treated fruits was, respectively, about 44, 27, 19, and 13 per cent. Pulling was also cheaper and quicker than

clipping, did not increase blue mould [*Penicillium italicum*], and was acceptable to the trade.

MORSTATT (H.). **Kaffee-Schädlinge und -Krankheiten Afrikas. (Fortsetzung.)** [Coffee pests and diseases in Africa. (Continuation).]—*Tropenpflanzer*, xxxix, 7, pp. 273–299, 15 figs., 1936.

This is a continuation of the writer's summary of the available information on coffee pests and diseases and their control in Africa [*R.A.M.*, xv, p. 577], the relevant sections of which have been noticed in this *Review* from other sources.

MAYNE (W. W.). **Annual Report of the Coffee Scientific Officer, 1935–1936.**—*Bull. Mysore Coffee Exp. Sta.* 14, 21 pp., 1936.

In further studies carried out in Mysore on the inheritance of resistance to *Hemileia vastatrix* in coffee [*R.A.M.*, xv, p. 16] a number of plants apparently resistant to both strains of the fungus were later found to be infected with a third strain. The indicator plant S. 5 was susceptible to strain 2 only, 288·45 to strain 3 only, 288·23 to none, while 288·5 was susceptible to all three strains. The evidence indicated that strain 3 is relatively uncommon. A large number of plants appear to be of the type of 288·23, and resistance to strain 3 also seems to be common among Kents. The simple one factor inheritance of resistance to strain 1 was confirmed, and further evidence was obtained that the inheritance of resistance to strain 2 is governed by two factors, one of which is probably the same as that governing inheritance of resistance to strain 1.

The conclusion previously reached [loc. cit.] that die-back is primarily a secondary disease following unfavourable conditions and that defoliation predisposes to it was confirmed. Examination of dead shoots showed clearly that in nearly every case decay had begun at the second or third node from the apex, where the leaf scars were much smaller than usual indicating leaves of the dwarfed type characteristic of flush in dry weather. The defoliation was probably caused by the extremely hot, dry weather, with less than 1 inch of rain in March, April, and May. The finer rootlets of the die-back plants had been killed off extensively. *Colletotrichum* [*coffeanum*] and several common saprophytes were present, but the evidence showed that the former, which occurs on the surface of quite healthy coffee shoots, is absent from the interior of the internodal tissue, thus further supporting the view that infection by *C. coffeanum* is secondary to predisposing factors.

The results obtained since 1930 with different spray materials against *H. vastatrix* showed no definite differences in effectiveness between plain Bordeaux mixture, fish oil-resin soap Burgundy mixture, resin-soda Bordeaux mixture, linseed oil Bordeaux mixture, and casein Bordeaux mixture. Furthermore, no satisfactory evidence of increased efficiency by the addition of vegetable oils was forthcoming and the writer concludes that adhesives and spreaders can safely be omitted from the Bordeaux spray. Further experiments made to ascertain the effects of varying the time of spraying again showed that locally the pre-monsoon application is essential and the second spray of minor importance.

MUNDKUR (B. B.). **Resistance of American Cottons to Fusarium wilt in India.**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 498–501, 1936.

Cotton wilt (*Fusarium vasinfectum*) [*R.A.M.*, xiv, p. 358] is stated to be common on light, sandy, acid soils of P_H 5·5 to 5·9 in the United States, whereas in India the fungus is confined to black clay soils of P_H 7·6 to 8.

In pot tests at Dhawar the American fungus proved to be quite incapable of attacking the Indian and Indo-American cottons. In similar tests at Ames, in the United States, the Indo-American cottons on American cotton soils proved to be as susceptible to the American fungus as the American cottons, but were still immune from the Indian fungus, indicating a strict specialization on the part of the fungus, the American form being unable to attack Indian cottons, and vice versa. Indian cottons on American soils are much less susceptible to the Indian form than in India. Apart from specialization, environmental factors are considered to affect pathogenicity markedly. The virulent American strain became almost non-pathogenic to the American and Indo-American varieties in Indian soils, whereas the Indian strain only weakly attacked Indian cottons in American soil. This difference in behaviour is attributed to the different textures and acidities of the two soils.

GULATI (A. N.). **A note on a new type of progressive damage to the structure of Cotton hair caused by micro-organisms.**—*Indian J. agric. Sci.*, vi, 3, pp. 861–865, 2 pl., 1 fig., 1936.

In connexion with a study on the etiology of deterioration in Broach cotton, the writer describes a hitherto apparently unrecorded form of damage consisting in the internal disintegration and corrosion of the cell wall, leaving only the cuticular sheath intact. The injury originates in infection at the basal end of, or at a tear in, the fibre by micro-organisms, of which about 17 species of fungi [cf. *R.A.M.*, xiv, p. 585] and three of bacteria, to be described in a later publication, were isolated from the affected samples.

Разработка системы мероприятий по защите от вредителей и боленей Хлопчатника в старых Хлопковых районах. [Development of the systematic control of Cotton pests and diseases in old-established Cotton-growing districts.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 217–248, 1936.

Most of the papers included in the section of this report, dealing with the control of cotton diseases, give details of investigations in 1935 of the physiology of cotton wilt, which, in south-east Russia and in Central Asia is stated to be chiefly caused by *Verticillium dahliae* [*R.A.M.*, xiii, p. 369; xv, p. 577]. A. S. Letoff found that the microsclerotia of *V. dahliae* germinated most abundantly (90 to 100 per cent.) in saccharose solutions with osmotic pressures between 7 and 10 atmospheres (0·3 to 0·4 mols saccharose), and that the osmotic pressure of the cell sap in the collar of native cotton varieties [*Gossypium herbaceum*] is of the same order at the stage of growth (flowering) when they are most susceptible to *V. dahliae* attack, while that of the cell sap of the highly

resistant, if not immune, Egyptian cottons is markedly higher. He suggests the possibility of raising the resistance of susceptible varieties by the application of adequate mineral fertilizers, a suggestion based on the facts that cotton plants growing in soils with high [common] salt content have a cell sap with higher osmotic pressure than normal, and that such plants were never seen to be attacked by the fungus. Preliminary tests indicate that the osmotic pressure of other host plants of the fungus lies within the range of the osmotic pressures at which the microsclerotia germinate freely, while that of species immune from it (monocotyledons) is invariably considerably higher.

In experiments recorded by Mme A. M. Eremeyeva it was found that under favourable environmental conditions and in the presence of sufficient inoculum cotton plants are liable to infection by germinating microsclerotia of *V. dahliae* in the soil from the time when the stems begin to become lignified to the end of the vegetation period. Under the peculiar weather conditions of 1935, which favoured a profuse but etiolated growth of the cotton plant, infection of the basal parts, revealed by the dark discoloration of the vascular tissues, was not reflected in the aerial organs, which showed no wilting. Such latently infected plants constitute a serious danger from the standpoint of the perpetuation of soil infection with *V. dahliae*.

According to Mme V. A. Yablokova, it was experimentally shown that both susceptible (native and American Upland) and resistant (Egyptian) cottons can be infected with *V. dahliae* through wounds at the cotyledonary first leaf stage, but that such early infections do not usually spread to any considerable extent in the host tissues, only traces of vascular discoloration being found later in both the susceptible and resistant hosts. At the flower bud formation stage infection of the susceptible varieties resulted in a widespread invasion of the host vessels both longitudinally and radially, the mycelium penetrating the vascular system of the leaves. A preliminary series of tests showed that spores of *Fusarium buharicum* [ibid., xv, p. 577] sprayed on cotton seedlings only penetrated the unwounded host cortex at the collar, from which the mycelium then spread to the pith.

Petch (T.). **New and rare Yorkshire fungi.**—*Naturalist, Lond., 1936*, pp. 57–60, 1936.

Of 11 fungi collected in Yorkshire included in this annotated list *Sphaeroderma fusisporum* n. sp. [with a Latin diagnosis] found on *Spicaria* (*Isaria*) *farinosa* [*R.A.M.*, xiii, p. 574] on a pupa is characterized by orange, later black, globose, astomate perithecia up to 0·3 mm. in diameter, which later develop a papillate ostiole and subsequently a collar round the orifice, but no setae. The asci measure 66 by 12 μ and the lanceolate, fuliginous, obtuse or truncated spores 20 to 24 by 6 to 9 μ. For an *Entomophthora* found on aphids at North Wootton and Barnard Castle and also received from America the author adopts the name *E. planchoniana* Cornu and proposes to rename in a forthcoming paper the American fungus referred by Thaxter to this species *E. thaxteriana*. The spore of Cornu's species is the shape of the old German spiked helmet. *Fusarium avenaceum* [ibid., xv, p. 643], determined by Reinking and Wollenweber, was found on an aphid. *Hirsutella*

aphidis n. sp., also collected on an aphid, is characterized by conidiophores laterally borne on the hyphae, up to 55 μ high, with a conical base about 20 μ high, 3 μ in diameter, and gradually attenuated into a long sterigma. The lemon-coloured spore cluster measures 10 by 5 to 6 μ, the individual conidia being cymbiform or oval, obtuse at the end, hyaline, continuous, and 6 to 10 by 1·5 to 2 μ.

IMAI (S.). **Studies on the Hypocreaceae of Japan. II.**—*Trans. Sapporo nat. Hist. Soc.*, xiv, 2, pp. 101–106, 1 fig., 1935. [Received 1936.]

This annotated list of 11 Japanese Hypocreaceae records *Cordyceps clavicipiticola* Tokunaga & Imai n. sp. parasitic on *Claviceps* sclerotia in the glumes of *Sasa paniculata* Mak. & Shib.; it is characterized by simple or branched, clavate or capitate stromata, 4 to 13 mm. high, subglobose or oblong, sometimes compressed, ochraceous or vermilion heads, 1 to 4 mm. in diameter; a straight, smooth, white or sulphur-yellow stalk; ovoid perithecia, 170 to 230 by 100 to 150 μ; and cylindrical asci, 100 to 150 by 2·4 to 3·6 μ, containing eight filiform, multiseptate, hyaline ascospores.

SHANOR (L.). **The production of mature perithecia of Cordyceps militaris (Linn.) Link in laboratory culture.**—*J. Elisha Mitchell sci. Soc.*, lii, 1, pp. 99–104, 1 pl., 1936.

The author obtained mature perithecia of *Cordyceps militaris* [*R.A.M.* xii, pp. 216, 567] on normal fruit bodies of the fungus in culture, by inoculating living pupae of *Basilona imperialis* and *Callosamia promethia* with mycelium from pure cultures of the organism, and by incubating them in a moist chamber with damp filter paper or in sterilized sphagnum moss. No perithecial stromata were produced on pupae that had been autoclaved before inoculation or on various media, though the fungus grew rapidly on the latter. The size of the fruit bodies varied with the size of the pupae and the number of stromata produced.

TANAKA (R.). **The effect of formalin as a disinfectant against the aquatic fungus which attacks the eggs of the Pond Smelt.**—*Trans. Sapporo nat. Hist. Soc.*, xiv, 2, pp. 138–141, 1935. [Received 1936.]

A species of *Saprolegnia* responsible for destructive epidemics in pond smelt (*Hypomesus olidus* Pallas) hatcheries in Japan [cf. *R.A.M.*, viii, p. 720; xii, p. 93] was satisfactorily controlled by the immersion for 30 minutes at three-day intervals (i.e., five times during the incubation period) of fertilized eggs of the fish in a 1 in 200 formalin bath, which reduced the mortality rate from 45·03 to 5·24 per cent.

ANDERSON (JOAN A. T.). **Gall-midges (Cecidomyidae) whose larvae attack fungi.**—*J. S.-E. agric. Coll., Wye*, xxxviii, pp. 95–107, 1936.

This comprehensive, annotated list of the species of Cecidomyidae whose larvae have been reported in various parts of the world to feed on, or to be associated with, fungi, includes *Mycodiplosis coniophaga* and *M. reaumuri* living on *Phragmidium subcorticium* [*P. mucronatum*: *R.A.M.*, xv, p. 506] on rose leaves, *M. gymnosporangii* found in the deformities produced on the branches of *Juniperus sabina* by *Gymno-*

sporangium clavariaeforme [ibid., xiv, p. 533], *M. melampsorae* living on the spores of *Melampsora 'salicina'*, *M. poriae* living on the spores of *Poria vaillantii* [ibid., viii, p. 3; ix, p. 78], and *M. tremulae* living on *Melampsora tremulae* on poplar leaves [ibid., xv, p. 618].

Dermatoses parasitaires d'origine végétale. [Parasitic dermatoses of vegetable origin.]—*ex* Nouvelle Pratique Dermatologique, Tome II, pp. 99–634, 15 pl. (14 col.), 261 figs., 5 diags., 2 maps, Paris, Masson et Cie, 1936.

The section on mycotic dermatoses of this monumental treatise on practical dermatology, the entire eight volumes of which comprise over 7,350 pages and 2,425 illustrations, contains fully documented chapters by Sabouraud, Gougerot, Langeron, and other specialists on the numerous forms of human disease associated with fungal infection. The present edition is designed to replace the 'Pratique Dermatologique' published in four volumes in 1900.

Memmesheimer (A. M.). **Beobachtungen über das epidemische Auftreten von Pilzerkrankungen in der Industrie.** [Observations on the epidemic occurrence of fungous diseases in industry.]—*Klin. Wschr.*, xv, 6, pp. 206–208, 1936.

During the last three or four years there has been a marked recrudescence of industrial mycoses in Germany, where they have been more prevalent than at any time since the world war and the period immediately following it. In this connexion particulars are given of two epidemics, in one of which (in a mine) Kaufmann-Wolf's *Epidermophyton* [*R.A.M.*, xv, p. 580] was ascertained to be the agent of the disease, affecting some 10 per cent. of the 2,000 workers employed.

Todd (Ramona L.) & Herrmann (W. W.). **The life cycle of the organism causing yeast meningitis.**—*J. Bact.*, xxxii, 1, pp. 89–97, 1936.

The writers report the isolation, from the spinal fluid of two male patients and from subcultures of eight other cases, of what is believed to be the perfect stage of the organism commonly known as *Torula histolytica* or following Benham, *Cryptococcus hominis* [*R.A.M.*, xv, pp. 153, 222]. A revision of the classification of the organism is thus necessitated and the following system of nomenclature is proposed. The ten strains of yeast meningitis conform to the description of the genus *Debaryomyces* Kloecker (*C. R. Lab. Carlsberg*, vii, p. 273, 1909) and the spore-forming strains of *C. hominis* (*T. histolytica*) [*Torulopsis neoformans*] should therefore be known as *D. hominis* (Vuillemin) Todd & Herrmann n. comb. The globose to ovoid vegetative cells measure up to 10 μ in diameter and are enclosed in a capsule. On Sabouraud's maltose or glucose agar (P_H 7) at 20° to 37° C., budding continues for six weeks or more under moist conditions, and is followed by the development of two types of cells, one spherical, thick-walled, 5 to 8 μ in diameter, each containing a large globule staining with Sudan III and osmic acid, and sometimes furnished with protuberances up to 3 or 4 μ in length, the other thinner-walled, spherical to ovoid (generally the latter), with several small, spherical bodies in the granular cytoplasm, and also frequently provided with tubes of varying length. On

two occasions fusion between these two types of cells was observed to be effected by means of the tube-like projections; other preparations indicated that the contents of the thin-walled cell passed to the thick-walled, giving rise directly to an ascus, containing a single, globose or slightly oval spore, fairly thick-walled, 7 to 11 μ in diameter, filled with up to 22 globules (commonly 14 to 18), and germinating by budding.

Allen (F. R. W. K.) & Dave (M. L.). **The treatment of rhinosporidiosis in man based on the study of sixty cases.**—*Indian med. Gaz.*, lxxi, 7, pp. 376–395, 5 figs., 1936.

A very comprehensive account, based on the detailed study of 60 Indian cases, is given of the etiology, taxonomy, pathological effects, distribution, mode of infection, diagnosis, and therapy of rhinosporidiosis (*Rhinosporidium seeberi*) [*R.A.M.*, xv, p. 446] in man; the disease is also stated to affect cattle and equines. Diagnosis consists in the observation of minute, white sporangia on the surface of the exfoliative, non-infiltrating granulomata in the nose, throat, and elsewhere and the detection of the spores, with their 10 to 16 refringent spherules, in stained smears of the secretion therefrom. The treatment of the disease is discussed.

Karunaratne (W. A. E.). **The pathology of rhinosporidiosis.**—*J. Path. Bact.*, xlii, 1, pp. 193–202, 7 pl. (1 col.), 1936.

During the last 13 years the writer has personally investigated in Ceylon 34 cases of rhinosporidiosis (*Rhinosporidium seeberi*) [see preceding abstract], which is so far represented in the relevant literature by only 53 records altogether. An account is here given of the structure and life-history of the parasite (based on Ashworth's monograph) [*R.A.M.*, iii, p. 153], supplemented by observations by the writer and others on the histology and morbid anatomy of the associated lesions, the clinical characters of the disease, and the mode of infection, with a brief note on the occurrence of rhinosporidiosis in animals.

Lefrou (G.) & Querangual des Essarts (J.). **Contribution au diagnostic des faux lépreux (deuxième mémoire). Les macules dyschromiques d'épidermomycose.** [A contribution to the diagnosis of cases of pseudo-leprosy (second memoir). The dyschromic plaques of epidermomycosis.]—*Bull. Soc. Path. exot.*, xxix, 7, pp. 743–749, 1936.

Clinical details are given of ten cases of Madagascan natives whose symptoms, simulating those of leprosy, were found to be associated with infection by *Malassezia furfur*, the agent of pityriasis versicolor [*R.A.M.*, xv, p. 295]. The diagnostic significance of these observations and the therapy of the condition are briefly discussed.

Ciferri (R.) & Baldacci (E.). **Acremoniella (Allescheriella) tarchiniana n. sp. isolata da una lesione nodulo-gommosa del solco sottomammario.** [*Acremoniella* (*Allescheriella*) *tarchiniana* n. sp. isolated from a nodular-gummous lesion of the sub-mammary sulcus.]—*Atti Ist. bot. Univ. Pavia*, Ser. IV, vii, pp. 329–339, 6 figs., 1936. [Latin and English summaries.]

From a nodular-gummous lesion of the sub-mammary sulcus of a

female patient a fungus was isolated which in culture formed a dense, cottony, later gypsum-coloured growth, with hyaline hyphae, 1·5 to 2·5 μ in diameter, cylindrical, septate, frequently short conidiophores constricted at the apex and 2 to 4 μ in diameter, and piriform to spheroidal, brown, thick-walled aleurochlamydospores, 9 to 13 by 8 to 10 μ, which were not observed to germinate. It is considered to belong to *Acremoniella*, agreeing with *Allescheriella*, regarded by the authors as a sub-genus of *Acremoniella* and is named *A.* (*Allescheriella*) *tarchiniana* n. sp., with a Latin diagnosis.

Carrión (A. L.). **Chromoblastomycosis: a new clinical type caused by Hormodendrum compactum.**—*Puerto Rico J. publ. Hlth*, xi, 4, pp. 663–682, 8 pl., 1936.

This is an amplified account of the new clinical type of human chromoblastomycosis caused by *Hormodendrum compactum*, and of the cultural and morphological characters of the fungus, a preliminary report on which has already appeared [*R.A.M.*, xv, p. 219].

Mougneau (R.) & Le Coulant (P.). **Myringomycoses dues à 'Sterigmatocystis nigra'.** [Myringomycoses due to *Sterigmatocystis nigra*.]—*Gaz. hebd. Sci. méd.*, lvii, 2, pp. 19–21, 5 figs., 1936. [Abs. in *Bull. Inst. Pasteur*, xxxiv, 16, pp. 787–788, 1936.]

A fungus of the *Sterigmatocystis nigra* [*Aspergillus niger*] type was isolated from a number of cases in the Hérault and neighbouring departments of France of mycosis of the external auditory canal [cf. *R.A.M.*, xii, p. 631]. The whitish or greyish accumulations at the base of the canal were sprinkled with typical black points, and were found to consist of epithelial débris mixed with a thick weft of large, regular, septate hyphae of the fungus.

Pinoy (P. E.). **Les mycoses de la rate.** [Mycoses of the spleen.]—*Rev. Path. comp.*, xxxvi, 474, pp. 367–374, 1936. [Abs. in *Bull. Inst. Pasteur*, xxxiv, 16, pp. 785–786, 1936.]

Aspergillus fumigatus, *A. jeanselmei* [*R.A.M.*, iii, p. 95], *Sterigmatocystis* [*A.*] *nantae* [ibid., xii, p. 445], and *Madurella mycetomi* are among the organisms responsible for mycoses of the spleen in animals, the last-named resulting in a black-grained mycetoma when inoculated into cats. In man the involvement of fungi in the causation of splenomegaly has been disputed, but from spleens with Gandy-Gamna nodules the writer has repeatedly isolated an *Aspergillus* close to *A. versicolor* in the *nidulans* group [ibid., vii, p. 782] and more recently a smoky-grey species with rounded 'heads' resembling those of *A. niger* but smaller. The brownish-yellow bodies of variable morphology found in the Gandy-Gamna nodules (from which alone fungi have been isolated) are believed to be old mycotic elements infiltrated by lime, while slender mycelial hyphae are also present; the former also develop as a sequel to inoculation with the smoky-grey *Aspergillus*. These results are considered to point to primary fungal implication in the etiology of splenomegaly.

Sharvelle (E. G.). **The nature of resistance of Flax to Melampsora lini.**—*J. agric. Res.*, liii, 2, pp. 81–127, 8 figs., 2 diags., 2 graphs, 1936.

In investigations described in detail in this paper on flax rust

(*Melampsora lini*) [*R.A.M.*, xv, p. 369] which causes in the United States an annual loss of approximately 2 per cent. of the total yield of seed flax, it was shown that the varieties of cultivated flax may be classified as immune (designated type 0), highly resistant (1), resistant (2), incompletely susceptible (3), and completely susceptible (4), and that varietal resistance cannot be attributed to any one single factor alone but is rather due to a combination of a number of different factors. Histological studies of the uredo stage on the different types indicated that the physiological properties of the host may be a factor in resistance or susceptibility; this view was supported by the fact that plant extracts varied in their ability to maintain the vegetative growth of uredospores in hanging drop cultures in accordance with the resistance or susceptibility of the plants from which they originated. The thickness of the epidermal membrane of leaves and stems may also be of considerable importance in the formation of uredosori and the liberation of the uredospores, since it was shown that the leaf and stem epidermis of varieties resistant to or immune from rust requires a significantly greater pressure to effect a puncture than that of certain susceptible varieties. A correlation was further found between the presence of a thick cuticle, the development of a hypodermis, and the isodiametric shape of the epidermal cells and the resistance of the epidermal membrane to puncture. No correlation, on the other hand, was established between rust resistance and the size, shape, and arrangement of the cortical fibres. The number of stomata and their functioning may be of significance in resistance, since it was found that the variety Bison, the stomata of which did not open until after the disappearance of dew from the leaves, developed very little rust in the field. The fact that in soil infected by *Fusarium lini* [ibid., xv, pp. 369, 652] flax plants usually fail to be rusted even in the presence of abundant inoculum, may possibly be due to the atrophy of the guard cells, and additional evidence of the part played by stomatal movements in rust resistance is that darkness during the incubation period apparently suppressed the development of the disease. Excess nitrogen and excess phosphate tended to increase rust development, and excess potassium to suppress it.

WATANABE (T.) & TAKESAWA (M.). **Studies on the leaf-spot disease of the Hemp.**—*Ann. phytopath. Soc. Japan*, vi, 1, pp. 30–47, 4 figs., 1936. [Japanese, with English summary.]

Septoria cannabis [*R.A.M.*, xv, p. 97] first appears on hemp (*Cannabis sativa*) foliage in Japan during the early summer, producing ellipsoidal or polygonal, yellowish- to greyish-brown spots, mostly on the basal leaves, and gradually spreading during the warm weather of June and July, so that premature defoliation often ensues.

The flat or spherical, light brown, ostiolate pycnidia, 27·5 to 115·5 μ in diameter, are usually immersed in the palisade tissue of the upper leaf surface. The filiform, straight, or slightly curved, smooth, hyaline, usually triseptate pycnospores measure 12 to 46 by 2 to 3 μ. In culture the pycnidia are brown to black and attain 85 to 465 μ in diameter. The most suitable media for mycelial growth and pycnidial formation were found to be, respectively, potato decoction agar and hemp decoction or soy agar. The minimum, optimum, and maximum

temperatures for mycelial growth were shown to be below 9°, 25°, and about 35° C., respectively. Mycelial development took place on Richards's solution at a hydrogen-ion range of P_H 1·8 to at least 9·8 and with an optimum at 5·2. On the same medium the highest percentage of pycnospore germination occurred at P_H 4·2 to 8·2, the proportion being low at 2·2 and moderate at 9·8 and above.

Positive results were given by inoculation experiments on hemp leaves with the pycnospores of the fungus from hemp decoction agar, the incubation period of the leaf spot in September being about six to seven days.

GITMAN (L.) & BOITSCHENKO [BOYTCHENKO] (E.). **Zur Frage der Verschiedenheit der zwei Septorien des Kendyrs Septoria littorea Sacc. und Septoria apocyni Chochrjak.** [On the question of the divergence of the two *Septoriae* of Kendir, *Septoria littorea* Sacc. and *Septoria apocyni* Chochrjak.]—*Phytopath. Z.*, ix, 3, pp. 337–347, 5 figs., 4 graphs, 1936.

A comparative study was carried out on *Septoria littorea* Sacc. and *S. apocyni* Chochrjak. [Khokryak.], the agents of leaf and stem spots of kendir fibre (*Apocynum venetum*) in U.S.S.R. [*R.A.M.*, xiii, p. 377], the morphological and cultural characters of which were not found to show sufficient differences to justify specific separation. The average spore length of *S. littorea* on dead kendir stems was 52 μ and that of *S. apocyni* 32 μ, while in cross-inoculation tests with the former on the stems and with the latter on the leaves the corresponding dimensions were 44 and 43 μ, respectively. *S. apocyni* further caused a brown discoloration and disorganization of the infected tissues, with incipient pycnidial formation at the line of demarcation between phloem and wood, while *S. littorea* remained confined to the phloem parenchyma layer adjoining the epidermis. On the basis of these studies *S. apocyni* is reduced to the rank of a form of *S. littorea* as *S. littorea* f. *apocyni*.

PAPE (H.). **Die Praxis der Bekämpfung von Krankheiten und Schädlingen der Zierpflanzen. Zweite Auflage.** [The practice of control of diseases and pests of ornamental plants. 2nd Edn.]—viii+427 pp., 8 col. pl., 297 figs., 6 diags., Berlin, P. Parey, 1936. Price RM. 18.

This second edition of the author's manual on disease and pest control in ornamentals, first issued in 1932 [*R.A.M.*, xi, p. 245], owes its appearance to the great increase both of theoretical and practical knowledge in the field covered by the treatise, necessitating extensive revision, the amplification of various sections, and the addition of over 30 illustrations.

KAWAMURA (T.). **Weiteres Studium über die Sklerotienkrankheiten der Tulpen unter besonderer Berücksichtigung von Scl. rolfsii Sacc.** [A further study on the sclerotial diseases of Tulips with special reference to *Scl. rolfsii* Sacc.]—*Ann. phytopath. Soc. Japan*, vi, 1, pp. 1–14, 1 fig., 1936. [Japanese, with German summary.]

Tulip bulbs in Japan are stated to be liable to infection by *Sclerotium rolfsii* (with which *S. tuliparum* [*R.A.M.*, viii, p. 725; x, p. 524; xv,

p. 632] is believed to be identical), *Botrytis cinerea* [ibid., v, p. 669], and *B. tulipae* [ibid., xv, p. 656].

At least eight strains of *S. rolfsii* [ibid., xv, p. 401] were differentiated on tulips, nearly all varieties of which appear to be uniformly attacked. Mostly negative results were given by inoculation tests with the tulip strains on a number of other flowering bulbs, but it was possible to infect crocus, *Scilla*, and hyacinth buds in process of development. The outcome of inoculation trials on tulip bulbs with the same strains was positive in every case. A new procedure for determining the longevity of the sclerotia consists essentially in leaving these bodies under controlled conditions for certain fixed periods and then transferring both whole and halved sclerotia to new media.

Wenzl (H.). **Epidemisches Auftreten von Botrytis parasitica Cav. auf Tulpen.** [The epidemic occurrence of *Botrytis parasitica* Cav. on Tulips.]—*Neuheiten PflSch.*, xxix, 3, p. 96, 1936.

The damp spring of 1936 was attended by the most destructive outbreaks of *Botrytis tulipae* (*B. parasitica*) [see preceding abstract] on outdoor tulips ever witnessed in Austria. Tens of thousands of plants were killed in Vienna nurseries alone; in one field only a minute fraction of the 100,000 tulips could be utilized for the market. The fungus ordinarily arrests growth and induces rotting in young plants or flower buds, but in the present instance the fully developed buds, opening blossoms, and leaves were attacked. Of outstanding importance in the control of the disease are transference to a fresh site and the use of healthy bulbs, the disinfection of which with 0·5 per cent. uspulun has given good results.

Wilhelm (A. F.). **Eine für Deutschland neue Bakterienkrankheit an Begonien.** [A bacterial disease of Begonias new to Germany.]—*NachrBl. dtsch. PflSchDienst*, xvi, 6, pp. 58–60, 3 figs., 1936.

Two pink begonia varieties in German nurseries have been affected by a bacterial leaf disease characterized by 'grease spots' of variable shape and often confluent; the diseased portions of the foliage turn yellowish-green and eventually become brown and necrotic. Infection frequently proceeds from the leaf margins, but may also originate along the veins, or at the leaf axes or scars, leading to petiole and stem invasion; in the last-named case the stem turns black and finally collapses. It is obvious that the resulting loss of leaves weakens the plants and renders them both unmarketable and practically useless for propagation. Severely diseased plants are completely destroyed.

The causal organism, isolated in pure culture on bouillon agar, is a non-motile, Gram-negative rod, 1·8 to 2·8 by 0·4 μ, forming canary-yellow colonies with a fatty, glistening aspect and liquefying gelatine. Inoculations with bacterial suspensions gave positive results on begonia leaves, from which the agent of the leaf spot was recovered. The incubation period of the disease under moist conditions in the greenhouse in June and July was 7 to 9 days, 10 in a heated greenhouse (25° C.) in December (when negative results were obtained at 8° to 13°), and 6 in February at 25°. Control measures are briefly indicated. The identity or otherwise of the present disease with that affecting

begonias in Denmark and Holland [*R.A.M.*, xv, p. 228] is not yet established.

LAUBERT (R.). **Eine neue Begonienkrankheit.** [A new Begonia disease.] —*NachrBl. dtsch. PflSchDienst*, xvi, 7, p. 68, 1936.

Attention is drawn to what is evidently a further case of the new bacterial disease of pink begonias already reported from Germany [see preceding abstract]. The disorder was apparently favoured by a high soil moisture content, and the condition of the plants was improved by transference to more permeable soil.

RICHTER (H.). **Die Gelbsucht der Sommerastern.** [Yellows of China Asters.]—*NachrBl. dtsch. PflSchDienst*, xvi, 7, pp. 66–67, 3 figs., 1936.

China aster (*Callistephus chinensis*) yellows [*R.A.M.*, xv, p. 156], previously known only from North America and Japan, has reached Europe, where it was first detected in Hungary [as reported by Dobroscky in a personal interview with H. H. P. Severin: *Hilgardia*, xiii, p. 339, 1934] and subsequently (1935) in Berlin. An account is given of the symptoms and mode of transmission of the disease, based mainly on the work of Severin and Kunkel in the United States.

GAUDINEAU (Mlle M.). **Le wilt ou flétrissement des Reines-Marguerites.** [Wilt or withering of China Asters.]—*Ann. Épiphyt.*, N.S., ii, 2, pp. 145–157, 1 fig., 1936.

Full details are given of the author's studies on the wilt of China aster [*Callistephus chinensis*] in France caused by *Fusarium conglutinans* var. *callistephi*, an account of which has already been noticed from another source [*R.A.M.*, xv, p. 583].

ASUYAMA (H.). **The life-cycle of heteroecious species of Puccinia. II. Puccinia kusanoi Diet.**—*Ann. phytopath. Soc. Japan*, vi, 1, pp. 27–29, 1936. [Japanese, with English summary.]

Inoculation experiments with *Puccinia kusanoi* Diet. from *Pleioblastus* (*Arundinaria*) *simoni* Nakai and *P. chino* (Franch. & Sav.) Makino [*A. chino* Makino] showed that *Deutzia scabra* Thunb. var. *crenata* Makino is one of the alternate hosts of the rust, the aecidial stage of which is identified with *Aecidium deutziae* Diet.

WHITE (R. P.). **Summary of nine years' experience with Rhododendron wilt.**—*Plant Dis. Reptr*, xx, 13, pp. 204–207, 1936. [Mimeographed.]

The most important disease of *Rhododendron ponticum* seedlings (communicable by inoculation to *R. carolineanum*, *R. maximum*, *R. catawbiense*, *R. californicum*, and *R. caucasicum* var. Boule de Neige) in New Jersey is the *Phytophthora* wilt due to *P. cambivora* [*R.A.M.*, xii, p. 696; xv, p. 655]. Infection originates in one or more plants in a nursery and rapidly extends over an increasingly wide area. In inoculation experiments the first signs of wilting appeared in plants growing in soil with a relatively high moisture content, but eventually all were killed at a range of 30 to 90 per cent. of the water-holding

capacity. Conclusive evidence was obtained that the soil temperatures normally reached during the winter at a 4 in. depth at New Brunswick, N.J., are lethal to the fungus, the survival of which from one season to the next is therefore improbable. The maximum loss from the wilt is commonly sustained two to three weeks after transplanting, indicating an increased tendency to infection following injury or disturbance of the root system. Control measures, based on improved cultural practices, are concisely indicated.

DODGE (B. O.). **A stem-rot of Euphorbia lactea.**—*J.N.Y. bot. Gdn*, xxxvii, 439, pp. 165–168, 2 figs., 1936.

A brief description is given of a rather soft stem rot of *Euphorbia lactea* (particularly of the *cristata* variety) in the New York Botanic Garden, isolations from which yielded an unidentified species of *Coniothyrium* which was shown by inoculation to cause the rot and also to attack small *Stapelia gigantea* plants; the fungus is being further studied. During the winter of 1935–6 some trouble was also caused by common grey mould (*Botrytis*) [*cinerea*] on *E. pulcherrima*, presumably owing to faulty aeration or to too low temperature in the greenhouse.

AGGÉRY (Mlle B.). **Quelques maladies nouvelles des Fougères.** [Some new Fern diseases.]—*Bull. Soc. Hist. nat. Toulouse*, lxvii, 4, pp. 5–201, 9 pl. (7 col.), 206 figs., 1935. [Received June, 1936.]

In this exhaustive account of four new fungal and two new bacterial diseases of ferns in the eastern Pyrenees a partial wilt of the small leaves of *Polypodium vulgare*, its var. *serratum*, and *P. cambricum* is attributed to a new species of *Sphaerella*, *S. subostiolica*. The upper surfaces of the leaves of *P. vulgare* and its var. *serratum* showed a spotting due to *Homostegia polypodii* n. sp. A leaf spot of *Scolopendrium officinarum* was caused by *Gloeosporium nicolai* [*R.A.M.*, xii, p. 373], and of the above-mentioned species of *Polypodium*, as well as of *Aspidium aculeatum*, by *G. polypodii* n. sp. A brown spot of *P. vulgare*, its var. *serratum*, and *P. cambricum* was caused by combined bacterial and eelworm infection, the former apparently being the more pathogenic. A yellow leaf spot of the same species of *Polypodium* was due to the action of bacteria followed by saprophytic infection by a new species of *Sphaerulina*, *S. polypodii*. All the new species of fungi are provided with Latin diagnoses.

Although the ferns under observation are of wild origin, they are stated to be largely cultivated in gardens and greenhouses in the Toulouse district, and for this reason control measures against the foregoing diseases are briefly indicated. Mention should be made of the excellent coloured plates illustrating this monograph, which is followed by a five-page bibliography.

NOBLE (R. J.). **Ergot in Paspalum.**—*Agric. Gaz. N.S.W.*, xlvii, 7, pp. 403–405, 410, 4 figs., 1936.

A short, popular account is given of paspalum (*Paspalum dilatatum*) ergot (*Claviceps paspali*) in New South Wales [*R.A.M.*, xv, p. 724], the chief points dealt with being the geographical distribution of the disease (United States, Argentine, South Africa, and New Zealand),

symptoms, life-history, and the effect of climatic conditions on infection. The ergots were most conspicuous in the late summer, as small globular structures on the seed-head spikelets; they ranged up to about $\frac{1}{8}$ in. in diameter, and were hard, horny, grey, and slightly roughened on the surface.

MAINS (E. B.). **Host specialization of Uromyces trifolii.**—*Pap. Mich. Acad. Sci.*, xxi, pp. 129–134, 1936.

In this paper the author describes the results of studies of the host specialization of *Uromyces trifolii* [*R.A.M.*, xiv, p. 794] started in 1923 at Purdue (Indiana) University Agricultural Experiment Station, and continued since 1930 at Michigan University. Cultures from different collections of clover rusts were maintained on susceptible plants of the species from which they were collected, inoculations being made in greenhouses from November to May.

The results obtained showed that most of the *Trifolium armenium*, *T. incarnatum*, and *T. pannonicum* plants inoculated with the rust from *T. pratense* were more or less resistant, though a few were moderately susceptible. The majority of the inoculated plants of *T. pratense*, grown from each of eight different lots of seed were, however, susceptible [ibid., viii, p. 176], a small proportion showing little or no infection. Two hundred and seven of the most resistant plants were then self-pollinated, and from the small amount of seed obtained (*T. pratense* being mostly self-sterile) both very susceptible and very resistant plants were produced, indicating that resistance is probably a dominant character.

The results of inoculations with the rust from *T. hybridum* showed only the natural host to be uniformly susceptible; one strain of *T. angustifolium* was very susceptible and another very resistant to the rust collected from Ann Arbor, Michigan; one strain of *T. armenium* and one of *T. subterraneum* were moderately susceptible, other strains of the same two species being resistant to collections of the rust from Indiana.

Three strains of *T. repens* showed little or no infection when inoculated with the rust taken from this species, five strains showed a few uredosori on some of the plants, while in six strains a majority of the plants were very susceptible, a small proportion showing resistance. Most plants of *T. incarnatum* were resistant to the rust from *T. repens*, but a few were moderately susceptible. One strain of *T. resupinatum* was very susceptible, and two were very resistant. Two strains of *T. parviflorum* were moderately and two of *T. glomeratum* very susceptible.

There is evidently a considerable variation in reaction to the rust within a number of the species of *Trifolium*. The author considers that it would not be surprising to find differences in pathogenicity within the rusts occurring on red, alsike, and white clovers.

BROADFOOT (W. C.). **Experiments on the chemical control of snow-mould of turf in Alberta.**—*Sci. Agric.*, xvi, 11, pp. 615–618, 1936. [French summary.]

Golf courses, bowling greens, and lawns in Alberta are stated to have

suffered severely of recent years from snow mould, which was shown to be constantly associated with a *Fusarium* sp., a *Rhizoctonia* sp. [cf. *R.A.M.*, xv, pp. 445, 706], and frequently with an unidentified Basidiomycete with characteristic clamp-connexions. In pathogenicity tests at 6° C. each of these organisms was proved to be capable of attacking Chewing's fescue (*Festuca rubra* var. *fallax*), from which it is concluded that all three, either alone or in combination with one another, may cause turf trouble in Alberta. In pure culture the three fungi grew fairly well at temperatures between 0° and 6°; for the *Fusarium* and *Rhizoctonia* species the optimum was between 20° and 25°, and for the Basidiomycete from 6° to 15°; the last-named ceased growth at 20°.

The results of experiments showed that the trouble may be effectively controlled by applications of from 4 to 8 oz. of mercuric chloride or calomel [mercurous chloride] in sharp, dry sand per 1,000 sq. ft. of turf, the higher doses not causing noticeable injury to the grass when the turf was lightly watered after application. Under the conditions in Alberta an autumn dressing of equal parts of mercuric chloride and the slower oxidizing calomel at the combined rate of 4 oz. per 1,000 sq. ft. is recommended.

WEBER (ANNA). **Aeblesygdomme onder Opbevaringen.** [Apple diseases in storage.]—Pamphlet issued by Faellesudvalget for Frugtavls-økonomie [Joint Committee for Fruitgrowing Economy], Copenhagen, 40 pp., 40 figs., 1936.

A useful, semi-popular account is given of the symptoms, etiology, economic importance, and control of some well-known physiological and fungal diseases [reference to which has frequently been made in this *Review*] affecting stored apples in Denmark.

HARDING (P. L.). **Distribution of total soluble solids and catalase in different parts of Jonathan Apples.**—*J. agric. Res.*, liii, 1, pp. 43–48, 2 figs., 1936.

Experiments in 1935 at the cold storage laboratory of the Arlington Experiment Farm, Virginia, indicated that in Jonathan apples affected with soft scald [*R.A.M.*, xiv, p. 770 and next abstract] soluble solids were consistently less than in normal apples; in both cases, however, the concentration of the solids was greatest in the skin and gradually decreased towards the pith. Catalase activity, on the other hand, was highest in the skin and lowest in the tissue immediately under the skin in normal apples, while in soft-scalded apples it was highest in the pith region and lowest in the diseased area comprising the skin and the brown tissue immediately below the latter. These results suggest that preliminary work to detect localized differences should precede chemical and physiological studies, in which apples are usually analysed as a whole.

MILLER (E. V.). **Distribution of acetaldehyde and alcohol in the Apple fruit.**—*J. agric. Res.*, lii, 1, pp. 49–55, 1936.

In this progress report the author states that the acetaldehyde and alcohol contents of the peel were shown to be higher in soft-scalded

Jonathan apples [see preceding abstract] than in normal fruit. The acetaldehyde content of the peel was also higher than normal in Grimes Golden apples affected with soggy breakdown. While the high acetaldehyde content of apple peel may in part be due to its production by cells ruptured in the paring process, there is also a tendency for the acetaldehyde to accumulate in peel either mechanically injured or impaired by abnormal physiological conditions of the fruit.

BROADFOOT (H.) & WHITTAKER (E. C.). **Superficial scald in Granny Smith Apples.**—*Agric. Gaz. N.S.W.*, xlvii, 7, pp. 393–395, 398, 2 figs., 1936.

Investigations [which are described, and the results of which are tabulated] carried out during a period of five years in New South Wales into possible means of prevention of superficial scald in Granny Smith apples kept for long periods in cold storage [*R.A.M.*, xiv, p. 769; xv, p. 482] showed that the use of oiled wraps or, instead, of thick layers of oiled strips between the tiers of fruit, greatly reduced scald, the oiled wraps giving better control and being easier to handle than the strips. Delayed storage without the use of oiled wraps gave some control, but the use of oiled wraps without delayed storage gave better results than delayed storage alone. By far the best results were given by the delayed storage of fruit in oiled wrappers.

The recommendations made (based on the experimental data obtained and other information) include holding the fruit in common storage in a well-ventilated shed for four to six weeks in cold, and two to three weeks in hot climates, and enclosing the apples in paper wrappers containing not less than 14 per cent. oil before placing them in the cold chamber.

SUTHERLAND (R.). **Prevention of storage wastage in Cox's Orange Pippin Apples.**—*N.Z. J. Agric.*, liii, 1, pp. 12–19, 6 graphs, 1936.

From 1932 to 1935 investigations into the causes of storage wastage in Cox's Orange Pippin apples were carried out by the New Zealand Department of Agriculture in co-operation with the Department of Scientific and Industrial Research and the New Zealand Fruit-export Control Board, the fruit being wrapped, packed, and forwarded to cold storage at Wellington through the usual channels as for export, and the examinations being made at times coinciding with the arrival of consignments at an overseas destination and subsequent marketing.

The results obtained showed that apples from light, sandy loams are less susceptible to bitter pit [*R.A.M.*, xv, p. 446] and internal breakdown [ibid., xv, p. 301] than comparable apples from clay soils (heavy loams). Bitter pit incidence varies from season to season with orchard conditions, is more serious in large than in small apples and on young than old trees (especially if the crop is light, and heavy rainfall occurs late in the growing season); susceptibility is greatest in apples picked when immature and becomes progressively less with maturity at picking. On the other hand, the more advanced the maturity at picking the greater the liability of the fruit to internal breakdown and fungal rotting. Internal breakdown was appreciably reduced by

storage at 37° F. instead of 32°. The paper concludes with notes on packing methods in relation to bruising.

DUFRÉNOY (J.). **Études épidémiologiques relatives à la tavelure du Pommier.** [Epidemiological studies relative to Apple scab.]—Reprinted from *Rev. Microbiol. appl., 1936*, 2, 20 pp., 3 figs., 2 graphs, 1936.

After referring to the need for the application of statistical methods to the study of the epidemiology of apple scab (*Venturia inaequalis*) in France, the author discusses the conditions requisite for attack and the resistance of apple varieties, and strongly emphasizes the importance of prompt and timely spraying with Bordeaux mixture or wettable sulphur as a preventive measure, warnings for which should be issued by wireless.

GANTE (T.). **Nachblütenspritzungen zur Schorfbekämpfung beim Kernobst.** [Post-blossom sprays for scab control in pome fruits.]—*Obst- u. Gemüseb.*, lxxxii, 7, pp. 110–111, 1936.

In districts with a heavy summer rainfall the post-blossom treatment of apple trees against scab [*Venturia inaequalis*] with copper-containing mixtures is liable to induce scorching [*R.A.M.*, xv, p. 36]. Under the relatively dry conditions prevailing at Geisenheim-am-Rhein, twelve varieties treated with 0·75 per cent. nosprasit [ibid., xiv, pp. 79, 701] when the apples were the size of a hazel-nut sustained no injury to the fruit, though White Transparent and Charlamowski showed slight foliar scorching. On the other hand, the use of 0·75 per cent. copper oxychloride preparations resulted in severe fruit injury on Beauty of Boskoop, moderate damage on Minister von Hammerstein, and slight russeting on six other varieties, including Yellow Bellflower and Canada Pippin. The susceptibility to copper injury manifested by apples at the hazel-nut to walnut-sized stage gradually decreases, and for the late July and August applications copper sprays may safely be used at weak concentrations. For the control of pear scab [*V. pirina*] post-blossom applications of copper oxychloride [ibid., xv, p. 234] are recommended in preference to Bordeaux mixture, which is apt to cause damage to the fruit.

HOCKEY (J. F.). **Studies in fruit diseases. IX. Apple scab.**—*Circ. Dep. Agric. Can.* 109, 8 pp., 4 figs., 1936.

This is a popular note on apple scab (*Venturia inaequalis*) and its control in Canada, with special reference to Nova Scotia. The first ascospore discharge usually occurs in Nova Scotia when the buds are in the 'green tip' or 'mouse-ear' stage, and the process reaches a climax at the time of full bloom or petal-fall. In addition to lime-sulphur and Bordeaux mixture, a combination of iron sulphate and lime-sulphur is extensively used in the Maritime Provinces [*R.A.M.*, xv, p. 159] and may safely be applied to wet foliage.

GOODWIN (W.), PIZER (N. H.), SALMON (E. S.), & WARE (W. M.). **The control of Apple scab: Allington Pippin and Newton Wonder, 1935.**—*J.S.-E. agric. Coll., Wye*, xxxviii, pp. 31–37, 1936.

In further comparative spraying tests against apple scab [*Venturia*

inaequalis: *R.A.M.*, xiv, p. 769] conducted in Kent in 1935, Newton Wonder trees given two pre- and two post-blossom applications of home-made Bordeaux mixture (8:12:100) and cotton-seed oil Bordeaux emulsion (as used in previous tests) [ibid., xiii, p. 779] gave, respectively, 38·8 and 34·2 per cent. scabbed apples, as against 92·7, 93·8, and 91·8 per cent. scabbed fruits in the unsprayed control plots. No results were calculated for similarly sprayed Allington Wonder trees as on these the crop failed. Clear evidence was again obtained that cotton-seed oil Bordeaux emulsion is as effective against *V. inaequalis* as hydrated-lime Bordeaux mixture, and it is recommended for commercial use on varieties tolerating Bordeaux mixture. In three seasons it caused no appreciable russeting. Further, while slight leaf-fall following frost occurred on trees of both varieties sprayed with Bordeaux mixture none was noted on the trees sprayed with the emulsion.

LINK (G. K. K.) & WILCOX (H. W.). **Relation of nitrogen-carbohydrate nutrition of Stayman Apple-trees to susceptibility to fire blight.**—*Phytopathology*, xxvi, 7, pp. 643–655, 1936.

This is an amplified account of studies, already reported in outline by the first-named writer [*R.A.M.*, xiv, p. 370], on the relation of succulence and woodiness in Stayman apple trees, the former condition induced by an excess, and the latter by a deficiency, of nitrate nutrient solutions, to fireblight (*Erwinia amylovora*) [*Bacillus amylovorus*] infection [see next abstract].

HILDEBRAND (E. M.). **Overwintering of Erwinia amylovora in association with severe winter injury on Baldwin Apple trees.**—*Phytopathology*, xxvi, 7, pp. 702–707, 1 fig., 1936.

Evidence is presented to show that *Erwinia amylovora* [*Bacillus amylovorus*: *R.A.M.*, xv, p. 662] is capable of surviving in winter-injured Baldwin apple tissues in New York, having been recovered from 85 (24·6 per cent.) of the 345 stem cankers examined in March, 1934, following an excessively cold winter. A reinspection of 116 cankers in the next autumn showed that 55 (47·4 per cent.) had progressed for distances of 1 to 5 in. during the season, while some were still alive and exuding their characteristic milky fluid in the summer of 1935.

WENZL (H.). **Eine neue Blattfleckenkrankheit des Apfels (Phyllosticta angulata n. sp.).** [A new leaf spot disease of the Apple (*Phyllosticta angulata* n. sp.).]—*Phytopath. Z.*, ix, 3, pp. 349–356, 2 figs., 1936.

Nursery apple trees in two of the more humid regions of Lower Austria were observed in 1935 to be affected by a leaf spot due to a species of *Phyllosticta* with pycnidia (on the upper surface only) 80 to 130 μ in diameter, with a circular ostiole, 13 to 17 μ in diameter, and unicellular, hyaline, elliptical spores averaging 5·5 to 6·5 by 2·7 to 3·4 μ, to which the name of *P. angulata* n. sp. is given [with a diagnosis in German only] on account of the angular shape of the lesions. These are 0·5 to 1 mm. in breadth, often confluent, visible on both leaf surfaces,

mostly without a sharply defined margin, yellowish-brown at maturity, and bounded by the fine veins; the aspect of the affected foliage is peculiarly mosaic-like.

CHEO (C. C.). **Tan spot rot of Peili (Pyrus bretschneideri Rehd.).**—*Bull. Chin. bot. Soc.*, ii, 1, pp. 1–15, 3 figs., 1936. [Chinese summary.]

Pear scab (*Fusicladium pirinum*) [*Venturia pirina*] is stated to be widely distributed in northern China, where a more serious disease of white pears (*Pyrus bretschneideri*) known as tan spot rot, is due, however, to *Corticium centrifugum* [*R.A.M.*, xv, p. 395]. The circular, tan spots on the fruits coalesce under damp conditions to large, dark brown, rotten areas, often covering over half the surface and liable to secondary invasion by a greenish-black *Alternaria*. The internal affected portion is conical and usually extends to a depth about equal to the diameter of the superficial lesions (up to 1·5 cm.). The diseased tissues turn brown and assume a dry, spongy consistency, while a cavity usually underlies the infected area. A peculiar sweet odour is sometimes emitted by the spotted pears. On the market tan spot rot is most prevalent during December and January.

Two strains, each regarded by the author as belonging to *C. centrifugum*, were isolated from *P. bretschneideri*, to which both are equally pathogenic. One of these, originally forming basidiospores in abundance on potato glucose agar, becomes sterile after several transfers in the laboratory; it produces a characteristic odour either on the host or on culture media. The second strain is sterile, but forms numerous sclerotia in culture and is non-odorous. The optimum temperatures for the development of strains 1 and 2 are 26° to 27° and 17° to 18° C., respectively. Both strains can infect *P. serotina*, a number of undetermined *P.* spp., and Hwailai apples, producing fish-eye spot [ibid., xiv, p. 701] through punctures on the last-named host. A strain of *C. centrifugum* from the Peihaitang variety of *Malus* [*P.*] *spectabilis* was found to be culturally and morphologically identical with strain 2 from *P. bretschneideri*, and each strain was cross-inoculable to the other host. The somewhat aberrant strains of the fungus (which are nevertheless thought to be merely physiologic forms of the same species) from two *P.* spp. and vine cuttings also cause typical tan spot symptoms on white pears.

HATTON (R. G.). **Plum rootstock studies: their effect on the vigour and cropping of the scion variety.**—*J. Pomol.*, xiv, 2, pp. 97–136, 4 pl., 1936.

Observations made at East Malling on the incidence of silver leaf disease (*Stereum purpureum*) [*R.A.M.*, xv, p. 729] in a trial plot of ten plum varieties showed that the most resistant varieties were Red Cherry Plum (Myrobolan), Prune Damson, Denniston's Gage, and Black Bullace with only 6, 22, 38, and 48 per cent. trees infected, respectively, as against 84, 80, 73, 73, 69, and 66 per cent. infected for Victoria, Belle de Louvain, Czar, Yellow Egg, Purple Egg, and Giant Prune. The final recoveries from infection amounted to 100 per cent. for Red Cherry Plum and Prune Damson, 96 per cent. for Yellow Egg,

and only 39 per cent. for Victoria, the others being intermediate in this respect. Whereas only 64, 66, and 67 per cent. of the varieties worked on Common Mussel, St. Julian (Seedlings), and Myrobolan (Seedlings) rootstocks, respectively, recovered, 77 per cent. of the trees on Yellow Egg (Pershore) and 87 per cent. of those on Common Plum returned to normal [ibid., xiv, p. 772].

In a further plot a sudden outbreak of bacterial die-back (*Pseudomonas mors-prunorum*) [ibid., xv, p. 729] occurred two years after planting, killing 40 Victoria trees in 1924, 8 in 1925, 10 in 1926, and 1 in each of the years 1927, 1932, and 1934. Rivers's Early Prolific remained unaffected, and two President trees were killed. These infections appeared to bear no relation to the rootstock. A planting of the Czar variety also suffered severely from bacterial die-back in the third, fourth, and fifth years after planting, there being no clear indication that rootstock influence affected resistance in any way; none of the trees of the Utility or Purple Egg varieties in the same plot were attacked.

NICOLAS (G.) & AGGÉRY (Mlle B.). **Une maladie grave des jeunes Pêchers des environs de Toulouse.** [A serious disease of young Peaches in the vicinity of Toulouse.]—*Bull. Soc. Hist. nat. Toulouse*, lxvii, 2, pp. 228–236, 7 figs., 1935. [Received June, 1936.]

A Latin diagnosis is given of *Dothiopsis rufa* n. sp., the agent of a severe die-back of young peach branches in a humid situation near Toulouse, the Précoce de Halle variety being chiefly affected and the Fleur de Mai and Amsden resistant. The fungus is characterized by numerous subglobose, black, unilocular stromata, 800 to 1,500 μ in diameter, 700 to 980 μ in height, with an ostiole, 160 μ in diameter, and by slightly curved, hyaline, continuous conidia, 5 to 8 by 1 to 5 μ, exuded in vermiform, reddish cirri from the hyaline, elongated conidiophores, 18 to 26 μ in length. The species is placed in *Dothiopsis* since the writers consider that this genus should comprise all unilocular and uniostiolar species, *Cytospora* being retained for those furnished with stromata consisting of several pycnidia and pores.

Control measures should be based on improved cultural practices and the application to the wounds through which the fungus enters of 2 to 3 per cent. Bordeaux mixture or potassium permanganate (350 gm. per hectol.), followed by painting with tar.

BODINE (E. W.). **Peach mosaic disease in Colorado.**—*Bull. Colo. agric. Exp. Sta.* 421, 11 pp., 9 figs., 1 diag., 1936.

A popular account is given of peach mosaic in Colorado [*R.A.M.*, xv, p. 559], where the widely grown Elberta and J. H. Hale varieties show the most pronounced symptoms, which are equally conspicuous on Stanwick and Red Roman nectarines. The writer insists on the importance of eradication even of only partially diseased trees, the detection of which necessitates frequent orchard inspections, e.g., as soon as the leaves have unfolded, a week or ten days later, at mid-season, and shortly before harvest.

HARRIS (R. V.). **Growing healthy Raspberries. The control of diseases and pests.**—*Rep. E. Malling Res. Sta., 1935*, pp. 232–242, 1936.

Notes are given on the symptoms and control of the chief diseases and pests attacking the Lloyd George raspberry variety in England, including blue stripe wilt (*Verticillium dahliae*) [*R.A.M.*, viii, p. 183; xii, p. 705], cane spot (*Elsinoe veneta*) [ibid., xiv., p. 219], spur blight (*Didymella applanata*) [ibid., xiv, pp. 595, 775], mosaic [ibid., xv, p. 377], and leaf scorch [ibid., xiii, pp. 40, 111, 173]. The paper concludes with a discussion of varietal susceptibility to raspberry diseases.

ZELLER (S. M.). **A new disease of Youngberry in Oregon.**—*Plant Dis. Reptr*, xx, 13, p. 209, 1936. [Mimeographed.]

Stigma and anther blight of youngberry (a hybrid dewberry), caused by *Haplosphaeria deformans* [*R.A.M.*, xiv, p. 495], has been observed in Oregon, this being apparently the first record of the fungus in the United States. 'Dry berry' of loganberries, due to the same organism, was also very prevalent in parts of Oregon in the early summer of 1936.

MARCEL (M.). **Étude sur la dégénérescence des Fraisiers (ses causes, comment y remédier).** [A study on Strawberry degeneration (its causes and how to control it).]—*Bull. Soc. nat. Hort. Fr.*, Sér. 6, iii, pp. 211–214, 1936.

Strawberry degeneration in France assumes various forms—rolling, crinkling, stunting, yellow edge [*R.A.M.*, xv, p. 732] and mosaic of the foliage, immature and hard fruits in the popular Parisian Madame Moutot variety; weak, straggling plants in the Vicomtesse Héricart de Thury (dating from 1849); and in certain centres of production a root rot characterized by blackening and desiccation of the cortex, a reddish discoloration of the interior, and an elongation of the tap-root, which is destitute of rootlets. Control by means of mass selection is suggested and discussed.

BERGMAN (H. F.) & WILCOX (MARGUERITE S.). **The distribution, cause, and relative importance of Cranberry fruit rots in Massachusetts in 1932 and 1933, and their control by spraying.**—*Phytopathology*, xxvi, 7, pp. 656–664, 2 graphs, 1936.

Early rots, chiefly due to *Glomerella* [*cingulata* var. *vaccinii*], *Sporonema* [*oxycocci*], and *Diaporthe* [*vaccinii*: *R.A.M.*, xi, p. 188], caused most of the spoilage of Early Black, Howes, Middleboro, and Holliston cranberries from unsprayed plots in the majority of the Massachusetts bogs inspected during the seasons of 1932 and 1933 [cf. ibid., xiv, p. 776]. *S. oxycocci* was found to be a much more important pathogen than would be suspected from previous reports, causing a loss of 30 to 38 per cent. of the berries from three untreated plots on one bog in 1933, while *D. vaccinii* was responsible for a reduction of 18 to 35 per cent. of the crop from several plots in the same year. *G. cingulata* var. *vaccinii* was the principal agent of spoilage in berries from unsprayed plots on certain sites in both years. *Godronia* [*cassandrae*: loc. cit.] and *Guignardia* [*vaccinii*: ibid., xi, p. 429] were much less injurious than the foregoing during the period under review; the

former apparently attacks the fruit during the latter part of the summer, since its incidence was very much lower in plots sprayed three times (the last application between 10th and 15th August) than in those receiving only two treatments. Apart from this, however, two applications of 4–6–50 Bordeaux mixture at the rate of 300 to 400 galls. per acre were frequently equally effective with three; potassium fish-oil soap was usually added at the rate of 1 lb. per 50 galls. water. Phenyl mercury acetate and ethyl mercury arsenate, used at the rate of 1 lb. in 100 galls. water, gave quite as good control as Bordeaux mixture on one bog in 1932. *S. oxycocci* proved more amenable to fungicidal treatment than either *Glomerella cingulata* var. *vaccinii* or *D. vaccinii.*

Bitancourt (A. A.). **Sobre Chaetothyrium guaraniticum Speg. e Chaetothyrina musarum (Speg.) Theissen.** [On *Chaetothyrium guaraniticum* Speg. and *Chaetothyrina musarum* (Speg.) Theissen.] —*Arch. Inst. biol. Def. agric. anim., S. Paulo,* vii, 1, pp. 5–22, 2 pl., 2 figs., 1936. [English summary.]

Chaetothyrina musarum (Speg.) Theissen (syn. *Chaetothyrium musarum* Speg.) is the agent of a prevalent sooty blotch affecting 'prata' [silver] and 'figo' [fig] bananas [*R.A.M.*, xv, p. 487] and occasionally attacking the 'maça' [apple] variety in Southern Brazil, where the Dwarf Cavendish, the sort chiefly used for foreign export, is, however, apparently immune. An examination of the type specimens of *Chaetothyrina musarum* and *Chaetothyrium guaraniticum* Speg. showed the former to belong to the Hemisphaeriales, with typical scutiform perithecia, while the latter is a representative of the Perisporiales, with closed conceptacles. An amended Latin diagnosis of the genus *Chaetothyrina* is therefore given, the other species *C. phoebes, C. consociata,* and *C. amadelpha* Syd., and *C. megalospora* Pet. & Cif. being referred to *Microcallis,* where they were originally placed.

Formaldehyde for seed and soil treatment. A bibliography.—55 pp., Wilmington, Delaware, The R. & H. Chemicals Department, E. I. du Pont de Nemours & Company, Inc., 1936. [Mimeographed.]

This annotated bibliography of the use of formaldehyde for seed and soil treatment is divided into two sections, (1) dealing with the effect on seeds and (2) with the fungicides containing formaldehyde and the effect on the pathogen (listed mostly under the common name).

Vinas (J.). **La protection des cultures par traitement à sec. Les poudres insecticides et anticryptogamiques. Leurs propriétés et leur préparation.** [Protection of crops by dusting. Insecticidal and fungicidal dusts. Their proprieties and their preparation.]—*Rev. Vitic., Paris,* lxxxiv, 2187, pp. 349–357; 2188, pp. 365–370; 2189, pp. 387–390; 2190, pp. 397–406, 5 figs., 1936.

After a brief historical outline of the practice of dusting crops with insecticidal and fungicidal dusts since its introduction by Kyle in England in 1846, the author gives a broad description of the newest developments both from the theoretical and practical standpoints. The advantages and drawbacks of dusting over spraying, the necessary chemical and physical properties of the dusts, dosage, and methods of

application, as well as details of their preparation and of the construction of hand- and mechanically-driven dusting apparatus, are separately dealt with at some length. A comprehensive bibliography of the relevant literature is given in the form of foot-notes.

DESRUE (A.). **Les alcools terpéniques sulfonés en agriculture.** [Sulphonated terpenic alcohols in agriculture.]—*Progr. agric. vitic.*, cv, 25, pp. 594–597, 1 fig., 1936.

In this paper the author states that sulphonated terpenic alcohols [*R.A.M.*, xv, p. 736] are eminently suitable for use as spreaders with sprays for the control of diseases caused by fungi either with intramatrical or with superficial mycelium, e.g., vine mildew [*Plasmopara viticola*] or *Oidium* [*Uncinula necator*].

MITTER (J. H.). **Some recent contributions to our knowledge of heterothallism in fungi.**—*J. Indian bot. Soc.*, xv, 3, pp. 183–192, 1936.

The history of contemporary research on heterothallism in different groups of fungi is concisely summarized and illustrated by references to some outstanding examples of the phenomenon, many of which have been mentioned from time to time in this *Review*.

MITTER (J. H.). **Fungous plant pathology and mycology in India.**—*Proc. twenty-second Indian Sci. Congr., 1935*, pp. 221–245, 1935. [Received 1936.]

In this address the author reviews in some detail the history of mycological work in India and urges closer co-operation between the Imperial Agricultural Research Institute, Delhi, and the Universities.

ALCORN (G. D.) & WORLEY (CLAIRE L.). **A new staining technic for perithecia of the Erysiphaceae.**—*Stain Tech.*, xi, 3, pp. 119–120, 1936.

The following technique has been found satisfactory for staining perithecia of the Erysiphaceae. The organs should be placed, immediately on removal from the host, in Ziehl's carbol fuchsin for 48 hours or more in an oven at 50° C., transferred to a clean slide, covered, opened by smart tapping on the cover slip, heated for 15 minutes in an oven at 95°, with the repeated addition of water to replace that lost by steaming, destained by drawing 6 to 10 drops of acid alcohol rapidly under the cover glass by means of filter paper, washed in a series of 25, 50, and 75 per cent. xylene in 95 per cent. alcohol, followed by pure xylene, and mounted in balsam or hyrax.

STEVENS (N. E.). **Environmental conditions and the wasting disease of Eel-Grass.**—*Science*, N.S., lxxxiv, 2169, pp. 87–89, 1 graph, 1936.

Finding the current explanations of the wasting disease of eelgrass (*Zostera marina*) [*R.A.M.*, xv, p. 671] unconvincing, the writer suggests that the cause of the phenomenon should be sought in other than purely local conditions. The three recorded periods of eelgrass scarcity coincide with the phases of extreme north declination of the moon, falling in 1894, 1912, and 1930, which it is thought may well be associated

with changes in obscure sea currents tending to weaken the plant or bring about fluctuations of temperature exceeding the narrow limits found by Setchell (*Science*, lvi, p. 575, 1922) to favour its growth. Another factor to be considered is that of extensive warm transgressions in the Atlantic Ocean, in which the continental waters of polar origin are invaded by tropical currents with marked effect on the abundance of fish. Three such transgressions coincided with the above-mentioned north declination phases of the moon, and though highly speculative it is not unreasonable to take into consideration the possibility that they contribute to the disappearance of the North Atlantic eelgrass at those times.

Blegvad (H.). **An epidemic disease of the Eel-Grass (Zostera marina L.).**—*Rep. Danish biol. Sta.*, xxxix (*1934*), pp. 3–8, 1 map, 1935. [Received 1936.]

In this general account of the dying-off of eelgrass (*Zostera marina*) [see preceding and next abstracts] in Denmark the author states that the decline mostly began during the autumn, winter, and spring of 1932–3, and it is noteworthy that the disease has followed the currents of the open waters, e.g., the main fairways of the Limfjord. Prof. E. Lönnberg, in a report from the Kristineberg (Sweden) Zoological Station (summer, 1933), attributes the spread of the condition from America to southern and thence to northern Europe to the vigorous pressure of 'southern bank water', which carries with it organic life of many types not forming a normal part of the local fauna.

Petersen (H. E.). **Preliminary report on the disease of the Eelgrass (Zostera marina L.).**—*Rep. Danish biol. Sta.*, xl (*1935*), pp. 3–8, 4 figs., 1935. [Received 1936.]

In studies on the wasting disease of *Zostera marina* [see preceding abstracts] at the Marine Biological Laboratory of Copenhagen University the writer found *Labyrinthula* [*R.A.M.*, xv, p. 671] in Danish material. The strikingly infectious character of the disease is believed to be due, however, to *Ophiobolus* [*halimus*: ibid., xiv, p. 599], formed principally in the rhizomes, the ascospores of which adhere readily to the outer leaves of the shoot. The greyish, later rusty-red *Ophiobolus* mycelium makes good growth on a decoction of sterilized *Zostera* material, boiled in salt water and mixed with agar. Some evidence of physiological specialization within the fungus is available.

Murphy (P. A.). **Some effects of drought on Potato tubers.**—*Emp. J. exp. Agric.*, iv, 15, pp. 230–246, 2 pl., 5 graphs, 1936.

As a result of studies carried out at Glasnevin, Ireland, from 1933 to 1935 the author distinguishes ten types of drought effect on the potato. Of these, cracking [cf. *R.A.M.*, xv, p. 525], often associated with hollow heart [ibid., xi, p. 535], is due to resumed growth following a check caused by drought. Absence of boron aggravates the condition, as do certain forms of virus diseases. Cracking may also occur during or after harvesting, and may then be caused by over-turgidity, as when frost kills the foliage but allows root action to continue.

Hollow heart affects large tubers mostly; the optimum soil temperature for the condition is approximately 18° C. Attacks are often associated with spindle tuber [ibid., xv, p. 460].

Visible stem-end wilt, best known in the United States, was only observed four times, in the President, Arran Pilot, and British Queen varieties. It is attributed to drought and excessive transpiration.

Glassy end [ibid., x, p. 335] is uncommon in Ireland, where it has been found only in Arran Cairn and Arran Pilot, which are particularly susceptible, as is Golden Wonder in Scotland, and Burbank in the United States. In Ireland it follows drought, and is associated with second growth, stem-end wilt, and premature sprouting; it is usually followed by a jelly-end rot. The stem end shows a progressive soft rot, in advance of which the flesh is yellow, glassy, and devoid of starch. The rot eats away much of the original tuber, and then stops, the diseased part being sloughed off.

Necrosis of the vascular ring and surrounding parenchyma due to drought and heat occurs under very hot conditions, the symptoms being most conspicuous in the outer phloem and cortex, especially at the rose and heel ends. In another form of the disease, groups of yellow or brown dead cells, varying from specks to areas half an inch in diameter, develop in any part of the flesh, sometimes in storage.

Bechhold (H.) & Erbe (F.). **Versuche zur Aufklärung des Mechanismus der 'Kupferprobe' zur Feststellung des Kartoffelabbaus.** [Attempts at the explanation of the mechanism of the 'copper test' for the determination of Potato degeneration.]—*Phytopath. Z.*, ix, 3, pp. 259–296, 4 diags., 1936.

It was ascertained by means of the copper strip test [*R.A.M.*, xv, p. 171] that no appreciable differences exist between sound and 'degenerate' potato tubers [see next abstracts] in respect of tyrosinase and melanin formation [ibid., xv, p. 526], whereas with regard to the oxidation-reduction system, the components favouring oxidation take precedence in healthy tubers and those stimulating reduction in diseased material. The action of the oxidation-reduction system on the copper strip is conceived as falling into two parts: in the first place, it causes the oxidation and dissolution of the copper, and secondly it induces, under the action of high temperatures (the experimental tubers were incubated at 37° C. for 8 hours and at 18° to 20° for 16 hours), damage to the membranes separating the cells mechanically injured by the insertion of the copper strip from the intact tissues. The metabolic disturbances arising from this secondary injury may ultimately involve large portions of the healthy tuber, whereas in the case of 'degenerate' material the oxidizing capacity of the tissues is inadequate to produce such far-reaching modifications. The sterilization of the test tubers and of the copper strip failed to alter the process in any particular, showing that micro-organisms play no part in the development of the characteristic tissue changes. The substitution of inert substances, e.g., wood, glass, or quartz for copper strips cannot be recommended, since the resultant tissue alterations, while generally resembling those described above, are not always sufficiently clear-cut to permit of the accurate diagnosis of health or disease. Rapid freezing

also leads to cellular injury and consequent blackening extending throughout the tuber.

WARTENBERG (H.) & LINDAU (G.). **Studien über die 'Dehydrasewirkungen' gesunder und abbaukranker Kartoffelknollen.** [Studies on the 'dehydrase reactions' of healthy and degenerate Potato tubers.]—*Phytopath. Z.*, ix, 3, pp. 297–324, 1936.

The expressed juices of 'degenerate' potato tubers were experimentally ascertained to undergo more rapid clarification in contact with a methylene blue solution (as indicated by the decoloration of the stain) than those of healthy material. The diagnostic use of this differential character is complicated by the failure of attempts to establish an objective standard of values for comparative purposes, but it appears certain from theoretical considerations that a parallel exists between the differences in the oxidation-reduction potentials of tissue emulsions of diseased and healthy tubers [see next abstract] and variations in their dehydrase reactions [*R.A.M.*, xiv, p. 650].

WARTENBERG (H.), HEY (A.), & TAHSIN (A.). **Untersuchungen über die Azidität des Gewebebreies der Kartoffelknolle. Die elektrometrische Pflanzgutwertbestimmung der Kartoffelknolle. II. Mitteilung.** [Studies on the acidity of the tissue emulsion of the Potato tuber. The electrometric determination of the seed value of the Potato tuber. Note II.]—*Arb. biol. Reichsanst. Land- u. Forstw., Berl.-Dahl.*, xxi, 4, pp. 499–516, 1 graph, 1936.

Measured by the hydrogen electrode (found to be preferable for the authors' purposes to the glass electrode), the tissue emulsions of 'degenerate' potato tubers [see preceding abstracts] showed a tendency to alkalinity, indicating the predominance of a carbonate-bicarbonate system which is less prevalent in healthy material. The actual reaction values of the tissue emulsions of 'degenerate' and sound tubers do not deviate appreciably from a mean hydrogen-ion concentration, so that differences in the seed value (oxidation-reduction) potentials are not substantially affected by acidity divergences.

BEAUCARNOT (R.). **Rendements comparatifs de l'Institut de Beauvais avec d'autres variétés résistantes à la galle verruqueuse.** [Comparative yields of the Institut de Beauvais with other varieties resistant to wart disease.]—*J. Agric. prat., Paris*, N.S., c, 10, pp. 200–203, 1936.

In experiments carried out in France on the effect of degeneration diseases [*R.A.M.*, xv, p. 597] on the yield of potato varieties resistant to wart [*Synchytrium endobioticum*: ibid., xv, p. 601], Max Delbrück contracted only 4 per cent. degeneration during the five years covered by the trials and gave a yield 197 per cent. that of Institut de Beauvais, the corresponding figures for Arran Banner, Kerr's Pink, Cellini, Ackersegen, Betula, Champion, and Sickingen being 175, 168, 155, 143, 136, 134, and 110 per cent., respectively. Cellini is becoming accustomed to light soils but Betula needs improvement from the standpoint of constitutional vigour, having developed 8 per cent. degeneration during the period of the observations. The Parnassia, Robinia, Arran

Pilot, and Belle de Fontenay varieties gave inferior yields and suffered severely from degeneration, so that their further cultivation, except on a small horticultural scale, is considered inadvisable.

Nyhus (P. O.). **The Potato situation in Argentina.**—*Amer. Potato J.*, xiii, 7, pp. 185–189, 1936.

Drought, insects, and diseases are stated to have decimated the 1936 Argentine potato crop, and the consequent sharp advance in prices has necessitated the purchase of foreign certified table and seed stocks from Germany, Scotland, the United States, and Canada. In Balcarce the heavy aphid infestation resulted in an extensive spread of mosaic and other virus diseases [*R.A.M.*, xv, p. 248]. In the Rosario district the writer examined on 15th May field after field with 70 per cent. or more of mosaic and leaf curl, locally known as 'crispy potatoes'. In Uruguay a similar situation prevails, and here the unreliability of uncertified foreign seed has been convincingly demonstrated by the development of over 60 per cent. mosaic and leaf curl in the progeny of a high-yielding crop of southern United States seed. Generally speaking, northern-grown certified seed of approved varieties, carefully rogued and sprayed, appears to give satisfactory yields for two or three generations, but it is hoped to improve the Balcarce (Argentine) crops to such an extent that they will serve as an economical source of supply for Uruguay.

Iwadare (S.). **On the geographical distribution of the black rot of Rice-grains and the relation of atmospheric temperature to the outbreak of the disease.**—*Rep. Hokkaido agric. Exp. Sta.* 36, pp. 1–52, 1 fig., 1 graph, 1 map, 1936. [Japanese, with English summary on pp. 2–4.]

Pseudomonas itoana Tochinai, the agent of a severe black rot of rice which is prevalent in the northern districts of Hokkaido and more sparsely distributed in other parts of Japan [*R.A.M.*, xi, p. 535], has been shown by six years' statistical studies (1929 to 1934) to be closely connected with atmospheric temperature relations. The disease occurs in seasons when the mean temperatures during July and August both exceed 20° C., while those above 22° favour epidemic outbreaks; under cooler conditions (below 20°) the incidence of infection is slight.

Killian (C.). **Étude sur la biologie des sols des hauts plateaux algériens.** [A study on the soil biology of the Algerian high plateaux.] —*Ann. agron., Paris*, vi, 4, pp. 595–614, 1 fig., 4 graphs, 1936.

In cultivated soil in the high plateaux region of Algeria the author found *Mucor mucedo* and *M. spinosus* [*R.A.M.*, xv, p. 257] in the proportions of 60 and 40 per cent., respectively, while uncultivated soil in the same locality showed the presence of *M. mucedo*, *Rhizopus niger*, *Aspergillus niger*, *A. calyptratus*, *Gliocladium penicillioides*, *Sporotrichum polysporum*, and *S. luteo-album* to the extent of 6, 10, 40, 10, 10, 18, and 1 per cent., respectively. The fungal content of uncultivated soil was only 57,000 individuals per gm. in April, 1934, as compared with 156,000 for the cultivated.

Galloway (L. D.). **Indian soil fungi.**—*Indian J. agric. Sci.*, vi, 3, pp. 578–585, 1936.

The most striking feature of the 200 fungal isolations from Indian soils, representing some 30 genera, is the predominance of *Aspergillus* spp., the most frequent of which was *A. nidulans* [*R.A.M.*, xv, p. 314, and above, p. 804], followed by *A. niger*, *A. terreus*, and *A. ustus*. *A. fumigatus*, a very common occupant of most soils, occurred in only three samples; contrary to Thakur's and Norris's results [ibid., viii, p. 334], however, it played an active part in cellulose decomposition, as also did *A. ustus*, *A. terreus*, *A. ochraceus*, *Penicillium* spp., *Chaetomium* (?) *indicum*, *Trichoderma lignorum* [ibid., xv, pp. 257, 526] (found only in two samples), *Melanconium* sp., representatives of the *tenuis* group of *Alternaria*, *Acrothecium lunatum* [*Curvularia lunata*: ibid., xv, p. 740], *Helminthosporium sativum* and *H. tetramera* [ibid., xiv, p. 622], *Stysanus stemonites*, *Dematium* sp., *Trichosporium* (?) *fuscum* [ibid., xv, p. 257], and (?) *Epochnium* sp.

Newhall (A. G.) & Nixon (M. W.). **Disinfecting soils by electric pasteurization.**—*Bull. Cornell agric. Exp. Sta.* 636, 20 pp., 4 figs., 7 graphs, 1936.

After describing two portable electric soil sterilizers [cf. *R.A.M.*, xv, pp. 255, 314], in one of which the current passes directly through the soil (Ohio type), while in the other it passes through resistance units (New York type), the authors state that both types destroyed a number of common pathogens, namely, *Erwinia carotovora* [*Bacillus carotovorus*], *Sclerotinia sclerotiorum*, *Rhizoctonia*, *Fusarium* sp., *Phytophthora cactorum*, and *Pythium ultimum*, it being unnecessary in the presence of adequate soil moisture to raise the soil temperature above 70° C. All kinds of soils were effectively treated by both types of apparatus, electric pasteurization apparently giving as good results as the best standard methods of soil and seed treatment for damping-off (*Pythium* and *Rhizoctonia*). The current consumed per cu. ft. per degree increase varied with the type of soil from 22 or 23 watts (pure sand) to 27 or 28 watts (muck soil). In general, an increase from initial 20° to final 70° required from 1 to 1·3 kilowatt hours per cu. ft.

A certain minimum initial soil moisture was found to be essential for the most effective working of both types of pasteurizer, though for different reasons. In the New York type it is needed for thermal conductivity and to prevent drying, and hence excessive heating, close to the heating units; in the Ohio type it is required to ensure rapid rise in temperature, as the soil solution carries the current.

Salmon (E. S.) & Ware (W. M.). **The downy mildew of the Hop in 1935.**—*J.S.-E. agric. Coll., Wye*, xxxviii, pp. 48–52, 1936.

In this account of the hop downy mildew [*Pseudoperonospora humuli*: *R.A.M.*, xv, p. 462] situation in England in 1935, the authors state that the production of basal spikes was less than usual, probably owing to cold, dry weather in April and May, though some spikes black with spores were found. Warm, wet weather at the end of June induced the formation of terminal and lateral spikes in some gardens, but

owing to subsequent drought there was no attack on the cones even in unsprayed gardens, the crops being free from infection for the third successive season. There is a danger that some growers may be caught unprepared in the next wet season.

SALMON (E. S.) & WARE (W. M.). **The Cladosporium disease of Hops.**—*J.S.-E. agric. Coll., Wye*, xxxviii, pp. 53–54, 1 fig., 1936.

In 1935 three further cases of infection of hop cones (Tutsham and Fuggles varieties) by a *Cladosporium* [*R.A.M.*, xiii, p. 354; xv, p. 462] were observed by the authors. So far, the disease has been sporadic, and has not necessitated control measures being taken, but owing to its resemblance to downy mildew [*Pseudoperonospora humuli*] growers in some cases pick the crop before it is ripe. In certain seasons the petals show a general pale brown discoloration, or isolated, pale brown patches, due to heat from the sun following morning mists. This 'sun scald' and the *Cladosporium* disease may occur on petals of the same cone.

VAN FLEET (W.). **Goldenseal under cultivation.**—*Fmrs' Bull. U.S. Dep. Agric.* 613 (revised), 13 pp., 6 figs., 1936.

Botrytis blight [*R.A.M.*, iv, p. 44] is stated to be the most destructive disease of golden-seal (*Hydrastis canadensis*), a perennial cultivated for its medicinal properties in Ohio, Indiana, West Virginia, Kentucky, and elsewhere in the United States. The fungus attacks all parts of the plant, the most conspicuous symptoms on which are leaf blight and basal rot of the petioles; 10 to 20 per cent. of the tops may be destroyed. Control measures should consist in the elimination of all diseased material, including mulching refuse in which the fungus may overwinter, spraying of the beds with copper sulphate (1 lb. in 10 galls. water) before replacing the mulch, and the application of Bordeaux mixture or some other standard fungicide—the last-named practice being, however, only partially effective.

DRECHSLER (C.). **Pythium graminicolum and P. arrhenomanes.**—*Phytopathology*, xxvi, 7, pp. 676–683, 3 figs., 1936.

The author does not concur in Carpenter's opinion (*Hawaii. Plant. Rec.*, xxxviii, p. 279, 1934) that *Pythium graminicolum* [*R.A.M.*, xv, p. 560] and *P. arrhenomanes* [ibid., xv, p. 432], both active agents of sugar-cane root rot in the southern United States, should be united as a single species. A close mycelial connexion between oogonium and antheridium, very frequent in *P. graminicolum* on maize meal agar, is rare in *P. arrhenomanes*, while in parallel cultures the sturdy, more substantial membranous portions of the sexual apparatus of the former species remain clearly discernible long after the evanescent antheridial envelopes and supporting branches of the latter have almost or entirely disappeared.

McCLEAN (A. P. D.) & HALSE (R. H.). **Streak disease of Sugar Cane. Its economic importance in South Africa.**—*S. Afr. Sug. J.*, xx, 7, pp. 431, 433, 435, 437, 439, 441, 443, 445, 447, 449–450, 1 diag., 1936.

The writers' studies on sugar-cane streak and its economic importance in South Africa have already been noticed from another source [*R.A.M.*, xv, p. 744].

Abbott (E. V.). **Conditions influencing germination of seed Cane and stands with disease resistant varieties.**—*Sug. Bull.*, xiv, 20, pp. 1–6, 1936.

Under Louisiana conditions rapid germination of immature seed cane can be obtained by planting early in August, thereby escaping the seed rots apt to develop in autumn planted stands. Varieties adapted to early August planting are Co. 281 and 290 and C.P. 807 and 28/19. Mosaic-free seed germinates better than diseased, especially in the case of Co. 281. Heavy losses may result from red rot [*Colletotrichum falcatum*: *R.A.M.*, xv, p. 605], especially among P.O.J. 213 and C.P. 807 stands, Co. 281 and 290 and C.P. 28/19 being more resistant to this fungus and giving an average germination percentage of 30 per cent. in the district under observation (compared with 10 to 20 per cent. for the noble varieties); the same figure is reached by an unreleased seedling, C.P. 29/116. In tests with November plantings in 1935 of the varieties, Co. 281 and 290 and C.P. 807, 28/19, and 29/320, only 22, 32, 28, 26, and 18 of 100 original sound eyes germinated, respectively, 13, 22, 17, 5, and 33 of the remainder being dead from disease. Red rot is the most important disease affecting seed cane, but during the winter of 1935–6 sheath rot (*Cytospora*) [*sacchari*: ibid., xiv, p. 348] has caused considerable deterioration of all commercial varieties, especially C.P. 807 and 28/19, and in some instances Co. 281. In cold, wet winters root rot (chiefly *Pythium* [*arrhenomanes*: ibid., xiv, p. 94]) may cause rotting of the first seed roots that develop.

Sandu-Ville (C.). **Beitrag zur Kenntnis der Erysiphaceen Rumäniens.** [Contribution to the knowledge of the Erysiphaceae in Rumania.] —*Anal. Acad. române*, Ser. III, xi, 5, pp. 181–250, 15 pl., 1936.

This annotated list of 40 species of the Erysiphaceae which have been recorded in Rumania supplements the previous list published by Săvulescu in collaboration with the author [*R.A.M.*, ix, p. 343], bringing the total record to 65 species on 273 host plants. The fungi are classified on the lines suggested by Blumer [ibid., xiii, p. 127], with the exception that the genus *Trichocladia* is retained as valid, representing a transitional form between the genera *Erysiphe* and *Microsphaera*. Specimens of all the species contained in the two lists are preserved at the Rumanian Agricultural Research Institute, and exsiccata of a large number of the species have also been issued in the Herbarium Mycologicum Romanicum.

Goidànich (G.). **Il genere di Ascomiceti 'Grosmannia' G. Goid.** [The genus *Grosmannia* G. Goid. of the Ascomycetes.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 1, pp. 26–60, 1 pl., 19 figs., 1936.

In this paper an exhaustive account is given of the new genus *Grosmannia* G. Goid. recently announced by the author [*R.A.M.*, xiv, p. 703]. The perithecia are characterized as subspheroidal, bearing sparse hairs, and with a rather short, rigid beak, sometimes with hyaline cilia at the apex. The globose-ellipsoidal asci arise irregularly within the ascocarp and are diffluent when mature. The ascospores are oval, cylindrical, or slightly curved and are expelled through the beak at the apex of which they form a light opalescent drop.

The conidial stage is referred to *Scopularia* Preuss., with which *Leptographium* [ibid., xii, p. 408] is regarded as synonymous. An emended Latin diagnosis of the genus is given. The conidiophores of *Scopularia* consist of (generally) pluricellular, brown hyphae intricately branched at the apex. The conidia are borne at the extreme branches of the conidiophore in heads of 2 to 6; they are hyaline, ellipsoid, or slightly curved and are contained in a drop of mucus at the apex. Spores are also produced on simple branches; the conidia can multiply by budding.

In *Grosmannia* the author places his new species *G. serpens* with its conidial stage *S. serpens* n. sp., isolated from wood of *Pinus sylvestris*. He also transfers to it *Ceratostomella penicillata* as *G. penicillata* (Gros.) n. comb., *C. pini* as *G. pini* (Münch) n. comb., and *C. ips* as *G. ips* (Rumb.) n. comb. the imperfect stages of these being *S. penicillata* [ibid., xiv, p. 703], *S. pini* n. sp., and *S. rumboldii* n. sp., respectively. Other species included in *Scopularia* are *S. lundbergii* (Lagerb. & Melin) G. Goid. (syn. *Leptographium lundbergii*) [ibid., ix, p. 77]; *S. phycomyces* (Auersw.) Goid. (syn. *L. phycomyces*) [ibid., xii, p. 409] and *S. microspora* (Davidson) n. comb. (syn. *L. microsporum*) [ibid., xiv, p. 729]. Latin diagnoses are given of the new genera and species.

The author considers that *Grosmannia* occupies a systematic position of particular importance, inasmuch as it consists of Ascomycetes which in their perithecial stage closely resemble others belonging to neighbouring genera, but are distinctly characterized when regarded in their perithecial and imperfect stages together. The author emphasizes the necessity of considering all the stages of a fungus in arriving at its correct systematic position, and considers that systematic mycology should be based on this principle. The genus *Grosmannia* belongs to the family Plectascales Ophiostomataceae and lies midway between *Microascus* and *Ophiostoma*.

ARTHUR (J. C.) & CUMMINS (G. B.). **Philippine rusts in the Clemens collection 1923–1926. I.**—*Philipp. J. Sci.*, lix, 3, pp. 437–449, 3 pl., 1936.

This is the first instalment of an annotated list of rusts collected by Mrs. M. S. Clemens in the Philippine Islands between 1923 and 1926, inclusive. The present section embraces rusts on monocotyledonous hosts, and one species on Pinaceae, *Peridermium insulare* Syd., found on *Pinus insularis*. In all, it includes 51 species, represented by 96 collections.

HIRATSUKA (N.). **A contribution to the knowledge of the rust-flora in the alpine regions of high mountains in Japan. (Contribution to the rust-flora of Eastern Asia. I.)**—*Mem. Tottori agric. Coll.*, iii, 2, pp. 125–247, 1 fig., 1935.

A fully annotated and tabulated list, supplemented by fungus and host indices and a bibliography of 81 titles, is given of 83 species of Uredinales (four new to science) occurring in the alpine regions of high mountains in South Saghalien, Hokkaido, and Honshu, of which 18 (21·69 per cent.) have also been found at similar altitudes in Switzerland [cf. *R.A.M.*, xii, p. 579]. A correlation was observed between the

lower atmospheric temperatures and the relative increase of microcyclic rusts towards the north and regions of high altitude. *Gymnosporangium nipponicum* Yamada n. sp. [with a Latin diagnosis], collected on *Juniperus chinensis* L. var. *sargentii* Henry, is characterized by minute, pulverulent, cinnamon-coloured, applanate or hemispherical sori differing from the wedge-shaped ones of the otherwise closely similar *G. haraeanum* [ibid., xiv, p. 533] on the leaves and more rarely on young branches; the diagnosis contains two descriptions of teleutospores, namely (1) ellipsoid or broadly ellipsoid, rounded at the apex and base, with one median septum, smooth, chestnut-brown 36 to 45 by 22 to 27 μ; and (2) oblong or fusiform, tapering towards the apex and base, with one median septum, smooth, pale yellow or subhyaline, 36 to 55 by 17 to 21 μ, with a very long, hyaline, cylindrical pedicel. The alternate host of the new rust is *Sorbus* [*Pyrus*] *aucuparia.*

HIRATSUKA (N.) & YOSHINAGA (T.). **Uredinales of Shikoku. (Contributions to the rust-flora of Eastern Asia. II.)**—*Mem. Tottori agric. Coll.*, iii, 2, pp. 249–377, 3 figs., 1 map, 1935.

This is a list, compiled on similar lines to the foregoing, of 294 species of Uredinales (including seven new ones and three new combinations) found in the province of Shikoku, Japan, where the rust flora bears some relationship to that of Europe, North America, India, Siberia, and South Saghalien.

KAMEI (S.). **On Milesina itoana, sp. nov. and its peridermial stage.**—*Trans. Sapporo nat. Hist. Soc.*, xiv, 2, pp. 97–100, 1 pl., 1935. [Received 1936.]

Details are given of inoculation experiments on *Abies mayriana* needles with sporidia of *Milesina itoana* n. sp. from overwintered fronds of the fern *Dryopteris crassirhizoma*, the results of which (spermogonial and aecidial development on the former host and uredospore and teleutospore formation on the latter, after inoculation with teleutospores and aecidiospores, respectively) are considered to establish a genetic connexion between the aecidial (*Peridermium*) stage on *A. mayriana* and the teleutospore (*Milesina*) phase on *D. crassirhizoma*. Considerable damage is caused by the rust to *A. mayriana*, to which it is, in fact, more highly pathogenic than any of the other 'white' rusts (some 15 in number, including *M. miyabei* [*R.A.M.*, xi, p. 813] and *M. carpatica* [ibid., xv, p. 469]), attacking the same host. *A. sachalinensis* suffers similar injury from the rust.

A Latin diagnosis is given of *M. itoana,* which is characterized by hyaline, subspherical spermogonia, 160 to 352 μ in width by 110 to 290 μ in height (average 260 by 200 μ); oblong to cylindrical, hyaline spermatia, 5 to 6 by 1 to 1·5 μ; cylindrical or laterally compressed, white aecidia, 0·2 to 0·5 mm. in diameter, 0·2 to 2 mm. in height, with subimbricated, polygonal peridial cells, 21 to 42 by 12 to 30 μ (26 by 18 μ); globose, ovate, or ellipsoid, hyaline, verrucose aecidiospores, 20 to 38 by 14 to 29 μ (25 to 20 μ); round uredosori with hyaline, irregularly polygonal, non-imbricated peridial cells, 4 to 16 μ in diameter; obovate or oblong, smooth, hyaline uredospores, 24 to 46 by

14 to 26 μ (30 by 18 μ); and vertically septate, pluricellular, smooth, hyaline teleutospores, the cells measuring 12 to 16 by 7 to 14 μ.

Ito (S.). **Notae mycologicae Asiae orientalis. II.** [Mycological notes from Eastern Asia. II.]—*Trans. Sapporo nat. Hist. Soc.*, xiv, 2, pp. 87–96, 1935. [Received 1936.]

Latin diagnoses are given of 24 fungi which are either new species, new combinations, or have hitherto been described only in Japanese [cf. *R.A.M.*, xv, p. 57]; the remaining eight new combinations are furnished with taxonomic, bibliographical, and geographical notes. *Ustilago kenjiana* n. sp., characterized by globose or ellipsoid, brown, echinulate spores, 4 to 7·6 μ in diameter (average 5 μ), produces subglobose or oblong, brownish-black, powdery sori, 3 to 6 mm. in diameter, covered with a light brown membrane, in the ovaries of sorghum in Manchuria. It differs from the closely related *U. bulgarica* [ibid., xii, p. 617] in its smaller spores and pulverulent sori, and from *Sphacelotheca sorghi* in its smaller spores and the absence of a columella.

U. tanakae n. sp. forms compact, black, covered sori, scarcely visible between the glumes, in the ovaries of *Setaria italica* var. *germanica* in Hokkaido. Its globose to angular or occasionally ellipsoid, brownish-black, verrucose spores measure 8 to 15 μ in diameter.

Sorghum ovaries and pedicels in Honshu are liable to invasion by *Sorosporium andropogonis-sorghi* n. sp., characterized by powdery, brownish-black sori, 5 to 15 mm. long, a columella surrounded by the disorganized cellulose of the glume tissues, and globose or ellipsoid, brown spores, 9·6 to 13·5 μ in diameter, sometimes with one or two hyphae united above the spore. This species differs from the related *S.* [*Tolyposporium*] *ehrenbergii* [ibid., xiii, p. 746] in the presence of numerous twisted fibres in its sori.

S. manchuricum n. sp. (*S. panici-miliacei* Takahashi p.p.), infecting the ears of *Panicum miliaceum* in Hokkaido, Honshu, and Manchuria, is characterized by masses of black, fusiform, erumpent sori, glomerules of variable shape, globose or ellipsoid 150 μ in diameter, ovoid 320 by 220 μ, or cylindrical 70 to 170 by 16 to 30 μ, and globose or ellipsoid, brown, smooth spores, 6 to 8 μ in diameter, occasionally up to 13 μ long.

U. paspali-thunbergii P. Henn. (*S. paspali* McAlp.), attacking the ears of *Paspalum thunbergii* Kunth. and *P. scrobiculatum* L. [ibid., ix, pp. 431, 775] is re-named *S. paspali-thunbergii* (P. Henn.) S. Ito n. comb.

Săvulescu (T.). **Contribution à la connaissance des Ustilaginées de Roumanie.** [Contribution to the knowledge of the Ustilaginales of Rumania.]—*Anal. Inst. Cerc. agron. Român.*, vii (*1935*), pp. 347–430, 35 pl., 1 map, 3 graphs, [? 1935. Received October, 1936.]

This is a copiously annotated list of 75 species belonging to 13 genera of the Ustilaginales which have been so far recorded on 84 different cultivated and wild host plants in Rumania, including one new species and one new specialized form. Exsiccata of most of the species have been issued in the Herbarium Mycologicum Romanicum. The world distribution of certain of the species described is indicated in a special table.

MUNDKUR (B. B.). **On the systematic position of the smut causing malformation of Vitis quadrangularis.**—*Indian J. agric. Sci.*, vi, 3, pp. 876–887, 1936.

The smut described by Iyengar and Narasimhan (*Phytopathology*, xii, p. 435, 1922) under the name of *Schizonella colemani* as causing a witches' broom of *Vitis quadrangularis* in Madras has been compared by the writer with herbarium material of the earlier *Mycosyrinx arabica* (Henn.) Penzig, collected by W. McRae on the same host in Madras in 1911 and identified by Sydow in 1914 (*Ann. mycol., Berl.*, xii, p. 487), and found to be identical with the latter.

ROGER (L.). **Quelques champignons exotiques nouveaux ou peu connus. II.** [Some new or little known exotic fungi.]—*Bull. Soc. mycol. Fr.*, lii, 1, pp. 80–84, 2 figs., 1936.

Continuing his earlier studies [*R.A.M.*, xiv, p. 396] the author gives notes, with technical descriptions, on four fungi from Africa and South America. *Helminthosporium lycopersici* Maublanc & Roger n. sp., found on tomato leaves at La Mé, Ivory Coast, is characterized by brown, short conidiophores bearing light brown, sometimes very pale, 7- to 14-septate conidia measuring 90 to 200 by 10 to 18 μ. The fungus occurred on lesions caused by a *Cercospora*, thought to be *C. canescens* [ibid., xiv, p. 87]. This is stated to be the first record of a *Helminthosporium* on tomato. *Coniothyriella theobromae* n. sp. was found on cacao pods, probably saprophytic, at Bingerville, Ivory Coast.

CASTELLANI (E.). **Ricerche preliminari sulla biologia di alcune Rizottonie.** [Preliminary researches on the biology of some species of *Rhizoctonia*.]—*Ann. Ist. sup. (agr.) for. naz.*, Ser. II, v, pp. 29–61, 2 pl., 16 graphs, 1935. [Received August, 1936.]

This paper on certain species of *Rhizoctonia* which are weak parasites of the roots of various plants is an expanded version in Italian of one already noticed from another source [*R.A.M.*, xiii, p. 597]. *R. callae*, belonging to the second, less virulent group of species, was obtained from *Calla* [*Zantedeschia*] *aethiopica*. Its optimum temperature for growth was 20° C., its optimum hydrogen-ion concentration was P_H 7·4, the maximum P_H 3·4 to 4·0, and the final P_H 7·7. Its virulence was limited.

CASTELLANI (E.). **Ricerche morfologico-sistematiche su alcune Rizottonie.** [Morphological and systematic researches on some species of *Rhizoctonia*.]—*Ann. Ist. sup. (agr.) for. naz.*, Ser. II, v, pp. 65–77, 6 pl., 7 figs., 1935. [Received August, 1936.]

In this expanded version of his earlier paper the author gives full technical descriptions [but no Latin diagnoses] of eight strains of *Rhizoctonia* isolated from the roots of various plants in Italy [*R.A.M.*, xiii, p. 598 and preceding abstract]; *R. solani* var. *cedri deodarae* [? n.var.] from deodar differs from the type in the less strong pigmentation, in the smaller and fewer sclerotia (up to 16 as against 20 mm.), and general appearance. *R. lupini* n. sp. is characterized by an ochraceous-yellow, later dark chestnut mycelium, with cells 50 to 65 by 7 μ, branching at right angles, with barrel-shaped cells (pseudoconidia) 30 by 12·5 μ, and sparse sclerotia 5 to 8 mm. in diameter and produced

only at rather high temperatures. *R. fraxini* n. sp. showed a dark, abundant, cottony mycelium with cells 24 to 60 (mostly 40 to 50) by 3·5 μ in diameter, and the angle of branching tending to be acute, with pseudoconidia 27 by 12 μ, sometimes dichotomously dividing, with subglobose, fulvous-violaceous to reddish-brown sclerotia 2 to 3 mm. in diameter, rough at the edges. *R. alpina* n. sp. has an abundant white, cottony mycelium with cells 72 to 108 (mostly 90 to 100) by 6 μ and numerous white, later faintly lemon-yellow sclerotia, 1 to 1·5 mm. in diameter, which develop in compact masses; the round pseudoconidia measure 24 by 17 μ. *R. pini-insignis* n. sp. shows a white mycelium with cells 22 to 67 (mostly 50) by 3 to 6 μ; the hyphae measure 3 to 6 μ in diameter, the pseudoconidia 25 to 30 by 6 to 7 μ, and the sclerotia 1 to 1·5 mm. in diameter. *R. callae* n. sp. has a white, cottony mycelium with cells 44 to 60 by 4 μ, sclerotia 0·6 to 1·5 mm. in diameter, and pseudoconidia 18 to 24 by 12 to 16 μ. *R. quercus* n. sp. is characterized by white, later ochraceous mycelium, with cells 130 to 140 by 4 to 6 μ, pseudoconidia measuring 22 to 28 by 10 to 12 μ, and sclerotia 0·3 to 0·8 mm. in diameter.

PRICE (W. C.). **Specificity of acquired immunity from Tobacco-ring-spot diseases.**—*Phytopathology*, xxvi, 7, pp. 665–675, 3 figs., 1936.

A systemic virus disease of tobacco, designated as ring spot No. 2 and characterized by the production on Turkish tobacco foliage of zonate necrotic spots, was shown by means of the immune reaction to be entirely distinct from ordinary ring spot (No. 1) [*R.A.M.*, xv, p. 751] and from the green and yellow forms of this disease. Tobacco plants infected by ring spot No. 2, which is transmissible by leaf rubbing to *Nicotiana glutinosa*, *N. sylvestris*, *N. langsdorffii*, tomato, bean (*Phaseolus vulgaris*), and cowpea, recover and acquire a solid immunity from the disturbance, but not from ring spot No. 1 or from any of the other eleven virus disorders tested. Ring spot No. 1 and green ring spot give complete protection against each other, but neither confers absolute immunity from the yellow type [ibid., xv, p. 614]; the last-named, however, protects against ring spot No. 1 and the green form, indicating a close relationship between these three viruses. Ring spot No. 1, green ring spot, and yellow ring spot do not protect tobacco against infection by the tobacco, aucuba, cucumber, or celery mosaic, potato veinbanding, potato ring spot, spotted wilt, etch, or severe etch viruses. These data are considered to demonstrate the specificity of acquired immunity from diseases of the tobacco ring spot group.

Destructive Insect and Pest Acts, England. The Fruit Tree Pests (Huntingdonshire, East and West Suffolk, and West Sussex) Orders of 1936. Nos. 129, 622, and 875 of 1936.—12 pp., 1936.

These orders, effective from 22nd February, 27th May, and 4th September, 1936, respectively, are on similar lines to those already issued to other local authorities [*R.A.M.*, xv, p. 272].

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, x, 7, pp. 153–155, 157–159, 1936.

AUSTRALIA (COMMONWEALTH OF). Quarantine 9P of 11th September,

1935 [cf. *R.A.M.*, xv, p. 688] specifically prohibits the importation of all stone fruit trees or parts thereof from countries (or any individual State of the United States of America) harbouring the diseases known as peach yellows [ibid., xv, pp. 688, 730], rosette, little peach, and phony [ibid., xv, p. 335]; all gooseberry plants or parts thereof from any country in which *Sphaerotheca mors-uvae* occurs; all plants or parts thereof, including fruits or seeds (other than manufactured products), liable to infection by any species of *Hemileia* from any country in which the latter exists; *Humulus* plants (except the dried flower cones commercially known as 'hops') grown in any country harbouring either *Pseudoperonospora humuli* or mosaic; citrus (tribe Citrinae only) plants (including the fruits but exempting the seeds) from any country in which *Pseudomonas citri* [cf. ibid., xiv, pp. 64, 564; xv, p. 64] occurs; all plants or parts thereof (including the fruits but exempting the seeds) of the family Rosaceae from any country in which *Bacillus amylovorus* exists.

Latvia. New regulations for the phytosanitary control of Latvian nursery-gardens authorize the inspection of the nurseries at least twice annually by experts who are empowered to order the destruction of apple, pear, plum, and cherry trees infected by various common pathogens.

Rumania. The Chief of the Rumanian Plant Protection Service announces that, for a period of five years commencing on 5th May, 1936, no young plants or seeds of *Pinus strobus*, *P. lambertiana*, *P. flexilis*, *P. monticola*, and *P. cembra* var. *sibirica* are to be introduced into the country, with a view to preventing the spread of *Cronartium ribicola*. The entire stocks of plants of these species in infested nurseries will be burnt and their further cultivation during the legislative period is prohibited.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, x, 8, pp. 174–175, 178, 1936.

Australia (Commonwealth of). A modification (Quarantine Proclamation No. 14P of 25th March, 1936) of Quarantine Proclamation No. 9P [see preceding abstract] permits the importation into Australia of apples from districts of New Zealand free from fire blight (*Bacillus amylovorus*) [*R.A.M.*, xiii, p. 707], subject to the conditions prescribed in the Regulations.

Italy. In order to prevent the spread of 'mal secco' disease of citrus (*Deuterophoma tracheiphila*) [see above, p. 774], a Ministerial Decree of 29th May, 1936, prohibits the export from Sicily of lemon, grapefruit, and citron plants and parts thereof.

Gesetze und Verordnungen. [Laws and ordinances.]—*NachrBl. dtsch. PflSchDienst*, xvi, 5, p. 55, 1936.

Germany. An Ordinance of the Corporation of Horticulture and Viticulture, dated 22nd April, 1936, and effective from that day prohibits the cultivation in nurseries and horticultural establishments of all the grey or blue forms (var. *glauca*) of *Pseudotsuga taxifolia* with a view to arresting the spread of needle fall [*Rhabdocline pseudotsugae*: *R.A.M.*, xiv, p. 483; xv, p. 608].

INDEX OF AUTHORS

GENERAL INDEX